# ANSWERS & EXPLANATIONS
# GENERAL STUDIES (P) TEST – 3803 (2023)

**Q 1.C**

- **The World Sustainable Development Summit (WSDS) is the annual flagship Track II initiative organized by The Energy and Resources Institute (TERI). Instituted in 2001, the Summit series has a legacy of over two decades for making 'sustainable development' a globally shared goal. Hence statement 1 is not correct.**
- The Summit platform has brought together thought leaders, heads of state and government, scholars, corporates, youth groups, and civil society representatives from across the world. The Summit series has established itself as a responsible and effective platform for mobilizing opinion-makers to drive ambition and advance pioneering actions to address some of the most relevant issues concerning sustainable development and climate change.
- **The only independently convened international Summit on sustainable development and environment, based in the Global South (developing world), WSDS strives to provide long-term solutions for the benefit of global communities by assembling the world's most enlightened leaders and thinkers on a single platform. Hence statement 2 is correct.**
- The Summit has witnessed numerous partnerships that have promised to strengthen the world's collective endeavours towards imagining a sustainable and environmentally secure future. The platform has reached out to the global community via exclusive features such as, High-level Ministerial Sessions, Plenary Sessions, Thematic Tracks, Youth Plenary, Women Leadership Session, International Dialogues, and CEO Forum, Media Colloquium, and various exhibitions on clean and green innovations.
- **The Summit has an important role to play in not just providing a platform for dialogues, but also creating new knowledge outputs through the Act4Earth initiative which was launched during WSDS 2022.** Through this summit plays a constructivist role, **to reinforce commitment at all levels to enhance ambition and action to create a more sustainable and equitable world for present and future generations. Hence statement 3 is correct.**

**Q 2.C**

- On February 19, 2016, the Indian Ministry of Road Transport and Highways (MoRTH) issued a draft notification of Bharat Stage (BS) VI emission standards for all major on-road vehicle categories in India.
- The **standards apply to light and heavy-duty vehicles, as well as two and three-wheeled vehicles**. As proposed, the BS VI standards will go into effect for all vehicles in these categories manufactured on or after April 1, 2020. **Hence, statement 1 is not correct.**
- The **Bharat Bharat Stage norms were introduced in India in the year 2000**, with the second and third iterations being introduced in 2001 and 2005 with the soubriquet BSII (BS2) and BSIII (BS3), respectively. The fourth iteration, BSIV, was introduced in 2017 and therefore the delay between the introduction of BS3 and BS4 resulted in fast-tracking the BSVI or BS6 emission norms rather than BSV (BS5) norms.
- As per BS-VI emission norms, **petrol vehicles will have to effect a 25% reduction in their NOx**, or nitrogen oxide emissions. Diesel engines will have to reduce their HC+NOx (hydro carbon + nitrogen oxides) by 43%, their NOx levels by 68% and particulate matter levels by 82%. **Hence, statement 2 is correct.**
- In addition to emission standards for new vehicles, the BS VI regulation also includes specifications for reference and commercial fuels. Fuel types include diesel, gasoline, and hydrogen. A key aspect of the fuel specifications is a limit on the **maximum allowable sulfur content in gasoline and diesel fuels of 10 ppm.**
- BS VI also makes **onboard diagnostics (OBD) mandatory** for all vehicles. OBD device informs the vehicle owner or the repair technician how efficient the systems in the vehicle are. **Hence, statement 3 is correct.**

- The **standards and timelines for their implementation of BS norms** are set by the Central Pollution Control Board (CPCB) under the Ministry of Environment, Forests and Climate Change. **Hence, statement 4 is not correct.**

**Q 3.B**

- The Dobson Unit is the **most common unit for measuring ozone concentration.**
- One Dobson Unit is the number of molecules of ozone that would be required to create a layer of pure ozone 0.01 millimeters thick at a temperature of 0 degrees Celsius and a pressure of 1 atmosphere (the air pressure at the surface of the Earth).
- Over the Earth's surface, **the ozone layer's average thickness is about 300 Dobson Units** or a layer that is 3 millimeters thick.
- **NASA uses a baseline value of 220 DU for ozone. This was chosen as the starting point for observations of the Antarctic ozone hole, since values of less than 220 Dobson units were not found before 1979.** Also, from direct measurements over Antarctica, a column ozone level of less than 220 Dobson units is a result of the ozone loss from chlorine and bromine compounds.
- **Hence, option (b) is the correct answer.**

**Q 4.D**

- The government has approved the Print and Digital Media Association (PADMA) as a self-regulatory body for publishers of news and current affairs across the country. **It is not a statutory body. Hence statement 1 is not correct.**
- The organisation — with 47 digital news publishers on board — will look at grievances related to digital media news content on their platforms.
- The organisation will be headed by former HC Judge Mool Chand Garg and have part-time member of Prasar Bharati Ashok Kumar Tandon and journalist Manoj Kumar Mishra as members. **Hence statement 2 is not correct.**

**Q 5.C**

- **Recently, Government has notified new norms on Bancassurance.**
- Bancassurance is an **arrangement between a bank and an insurance company allowing the insurance company to sell its products to the bank's client base.** This partnership arrangement can be profitable for both companies. Banks earn additional revenue by selling insurance products, and insurance companies expand their customer bases without increasing their sales force. **Hence option (c) is the correct answer.**
- Bancassurance as we know it today appears to have begun in France in the 1970s (which would account for its seemingly French name). Spain was also an early adopter, in the 1980s. **Both of those countries continue to be bancassurance market share leaders.**

**Q 6.A**

- **Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016:**
- For the first time, Rules have been made to distinguish between Hazardous Waste and other wastes. Other wastes include: Waste tyre, paper waste, metal scrap, used electronic items, etc. and are recognized as a resource for recycling and reuse. These resources supplement the industrial processes and reduce the load on the virgin resource of the country.
- Responsibilities of State Government for environmentally sound management of hazardous and other wastes.
    - Department of Industry in the State or any other government agency authorized in this regard by the State Government, to ensure earmarking or allocation of industrial space or shed for recycling, pre-processing and other utilization of hazardous or other waste in the existing and upcoming industrial park, estate and industrial clusters.
- Grant of authorization for managing hazardous and other wastes.
    - Every occupier of the facility who is engaged in handling, generation, collection, storage, packaging, transportation, use, treatment, processing, recycling, recovery, pre-processing, co-processing, utilization, offering for sale, transfer or disposal of the hazardous and other wastes shall be required to make an application to the State Pollution Control Board and obtain an authorization from the State Pollution Control Board.
- Power to suspend or cancel an authorization.
    - The State Pollution Control Board, may, if in its opinion the holder of the authorization has failed to comply with any of the conditions of the authorization or with any provisions of the Act or these rules

and after giving him a reasonable opportunity of being heard and after recording reasons thereof in writing cancel or suspend the authorization issued.

- Import and export (transboundary movement) of hazardous and other wastes.
  - **The Ministry of Environment, Forest and Climate Change shall be the nodal Ministry to deal with the transboundary movement of hazardous** and other wastes in accordance with the provisions of these rules. **Hence statement 1 is correct.**
- **Strategy for Import and export of hazardous and other wastes.**
  - No import of hazardous and other wastes from any country to India for disposal shall be permitted.
  - **The import of hazardous and other wastes from any country shall be permitted only for recycling, recovery, reuse and utilization including co-processing. Hence statement 2 is not correct.**

**Q 7.D**

- **Plastic Waste Management Rules, 2016 (as amended in 2018 and 2021):**
- Rural areas have been brought into ambit of these Rules since plastic has reached to rural areas also. Responsibility for implementation of the rules is given to Gram Panchayat.
- Individual and bulk generators like offices, commercial establishments, industries are to segregate the plastic waste at source, handover segregated waste, pay user fee as per bye-laws of the local bodies.
- **Carry bags made of recycled plastic or products made of recycled plastic shall not be used for storing, carrying, dispensing or packaging ready to eat or drink food stuff. Hence statement 2 is correct.**
  - plastic material, in any form including Vinyl Acetate - Maleic Acid - Vinyl Chloride Copolymer, shall not be used in any package for packaging gutkha, pan masala and tobacco in all forms.
- Every producer shall maintain a record of details of the person engaged in supply of plastic used as raw material to manufacture carry bags or plastic sheet or like or cover made of plastic sheet or multilayered packaging.
- **No person shall manufacture carry bags or recycle plastic bags or multilayered packaging unless the person has obtained a registration from the State Pollution Control Board** or the Pollution Control Committee of the Union Territory concerned, as the case may be, prior to the commencement of production. **Hence statement 3 is correct.**
- The manufacture, import, stocking, distribution, sale and use of the following single-use plastic, including polystyrene and expanded polystyrene, commodities shall be prohibited with effect from the 1st July, 2022:-
  - ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene for decoration.
  - plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping or packing films around sweet boxes, invitation cards, and cigarette packets, plastic or PVC banners less than 100 micron, stirrers.
- In order to stop littering due to lightweight plastic carry bags, with effect from 30th September 2021, the thickness of plastic carry bags has been increased from fifty microns to seventy-five microns and to one hundred and twenty microns with effect from the 31st December 2022.
- This will also allow the reuse of plastic carry due to increase in thickness. The plastic packaging waste, which is not covered under the phase out of identified single-use plastic items, shall be collected and managed in an environmentally sustainable way through the **Extended Producer Responsibility of the Producer, importer and Brand owner (PIBO), as per Plastic Waste Management Rules, 2016.**
  - For effective implementation of Extended Producer Responsibility, the Guidelines for **Extended Producer Responsibility being brought out have been given legal force** through Plastic Waste Management Amendment Rules, 2021. **Hence statement 1 is correct.**

**Q 8.A**

- **The Global Geothermal Alliance** (GGA) is designed to ramp up the share of geothermal energy in the global energy mix both in the areas of geothermal power generation and the direct use of geothermal heat. The GGA serves as a platform for dialogue and knowledge-sharing among governments, international financing institutions, private sector investors and other practitioners as well as a coalition for action to increase the share of installed geothermal electricity and heat generation worldwide.
- **The Alliance has an aspirational goal to achieve a five-fold growth in the installed capacity for geothermal power generation and more than two-fold growth in geothermal heating by 2030. Hence statement 1 is correct.**
- **It was launched at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), held in Paris, France, in December 2015. Hence statement 2 is not correct.**

- Member countries include geothermal resource-rich countries with established or emerging geothermal markets, along with other countries that wish to support the activities of the Alliance. India is a member country of the Alliance.

**Q 9.D**

- **Radioactive contamination** occurs when radioactive material is deposited on or in an object or a person. Radioactive materials released into the environment can cause air, water, surfaces, soil, plants, buildings, people, or animals to become contaminated. Such contamination presents a hazard because the radioactive decay of the contaminants produces ionizing radiation (namely alpha, beta, gamma rays and free neutrons).
- Various treatment methods like **aeration, reverse osmosis, ion exchange and granule carbon adsorption** are effective remedial measures for treating radioactively contaminated water.
    - **Aeration:** It is well-developed technology in the cleanup and wastewater treatment industries. It is a process that promotes volatilization and biological degradation by bringing contaminated media into contact with the air. It can be applied to remove high levels of radon (222Rn) from drinking water.
    - **Reverse Osmosis:** Reverse Osmosis is a process where we can demineralize or deionize water by pushing it under pressure through a semi-permeable Reverse Osmosis Membrane. Reverse osmosis (RO) is used for the removal of various radioactive elements, including alpha and beta particles, uranium, radium and photon emitters. it can remove up to 99% of these contaminants.
    - **Ion exchange:** During ion exchange treatment, water is passed through a resin containing exchangeable ions. Stronger binding ions displace weaker binding ions and are removed from the water. Ion exchange is used for the removal of radium, uranium, alpha, and beta particle and photon emitters. It can remove up to 99 percent of these contaminants.
    - **Granule carbon adsorption:** In this method, Granular activated carbon (GAC) is used which is a porous adsorption media with an extremely high internal surface area. It is useful for the removal of radioactive contamination from water.
- **Hence option (d) is the correct answer.**

**Q 10.D**

- The Ramsar Convention on Wetlands is an international convention that came into force in 1975. **The convention provides the framework for international cooperation for the conservation and wise use of wetland habitats. Hence statement 1 is correct.**
- **The United Nations Educational, Scientific and Cultural Organisation (UNESCO) serves as the Depository for the Convention,** and its secretariat, the Ramsar Bureau, is in Gland, Switzerland. India became a signatory to this convention in 1981. **Hence statement 3 is correct.**
- The Convention aims to halt the loss of wetlands and to ensure the conservation of fauna and flora and their ecological processes. Obligations of parties include:
    - designating one or more wetlands for inclusion in the list of Wetlands of International Importance
    - promoting wise judicious use of wetlands, including mangroves.
    - promoting the conservation of wetlands through the establishment of nature reserves.
    - **irrespective of their listing under the Convention and managing wetlands for the benefit of water fowl. Hence statement 2 is correct.**
    - promoting training in the field of wetland research, managing and warding.
    - consulting with other parties about the implementation of the convention, especially with regard to trans frontier wetlands, shared water systems, shared species, and development of wetland projects
- Ramsar is not affiliated with the United Nations system of Multilateral Environmental Agreements, but it works very closely with the other MEAs and is a full partner among the "biodiversity-related cluster" of treaties and agreements. World Wetlands Day, 2 February every year. Today 170 nations are signatories to the Ramsar Convention.

**Q 11.D**

- The Perform Achieve and Trade Scheme is one of the initiatives under the National Mission on Enhanced Energy Efficiency (NMEEE). **Energy Saving Certificate (ESCert) under the Perform, Trade and Achieve (PAT) scheme is a market-based mechanism to reduce the specific energy consumption (SEC) in energy-intensive large industries. Hence statements 1 and 2 are correct.**
- This mechanism is facilitated through the trading of Energy Saving Certificates (ESCerts) which are issued to those plants that have overachieved their targets. Those plants which underachieve their targets are entitled to purchase ESCerts.
- It covers 13 sectors (Designated Consumers) including- Aluminium, DISCOMs, Hotels (under commercial buildings), Cement, fertilizers, Pulp & Paper, Thermal Power Plant, Iron & Steel etc.

- As per PAT rules, when a designated consumer overachieves the notified SEC targets in the compliance year, the ESCerts are to be issued by Central Government for the difference of quantity between notified target and the achieved SEC.
- ESCerts are traded on Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL). **ESCerts trading is regulated by the Central Electricity Regulatory Commission (CERC)** with the Bureau of Energy Efficiency (BEE), Ministry of Power as the Administrator. **Hence statement 3 is correct.**

**Q 12.A**

- **Surfactants are Surface-active chemicals,** including synthetic detergents that cause problems in sewage treatment plants and **in natural streams because of their ability to form froth**. The problem has been worsened because the conventional alkyl benzene sulfonate surfactants are persistent and refractory. Despite their organic composition, they are broken down but slowly by natural stream organisms.
- **Surfactants pose the problem of foaming in sewage treatment.** This is because **some surfactants need special treatment and some cannot be treated biologically.** This is partly due to the ionic charge on active molecules.
- Surfactants are amphiphilic molecules. Their heads are polar, or hydrophilic, and their tails are hydrophobic. **They are soluble in both organic solvents and water. The surfactant reduces the surface tension of water by adsorbing at the liquid–gas interface.**
- **Hence, option (a) is the correct answer.**

**Q 13.A**

- **Renewable Energy Certificates (RECs) are a market-based instruments that certify the bearer owns one megawatt-hour (MWh) of electricity generated from a renewable energy source.** The concept of REC assumes significance to address the mismatch between the availability of renewable energy (RE) sources and the requirement of the obligated entities to meet their RPO. It is also expected to encourage the RE capacity addition in the States where there is potential for RE generation as the REC framework seeks to create a national-level market for such generators to recover their cost. **Hence statement 1 is correct.**
- The REC received can then be sold on the open market as an energy commodity once the power provider has fed the energy into the grid. Earned RECs can be sold to other polluting entities as a carbon credit, for example, to offset their emissions.
- **Central Electricity Regulatory Commission (CERC) has notified the regulation on Renewable Energy Certificate (REC) in fulfillment of its mandate to promote renewable sources of energy and development of the market in electricity.**
- **A REC that has already been sold by the REC registry in India cannot be purchased again. All renewable energy credits are assigned a unique number and often include information such as the location of generation, the kind of renewable resource used, and a generation date stamp. The transmission of RECs is monitored and logged. Hence statement 2 is not correct.**
- The distribution companies, Open Access consumers, and Captive Power Plants (CPPs) will have the option of purchasing the REC to meet their Renewable Purchase Obligations (RPO). Pertinently, RPO is the obligation mandated by the State Electricity Regulatory Commission (SERC) under the electricity act, to purchase a minimum level of renewable energy out of the total consumption in the area of a distribution licensee.
- **The REC once issued shall remain valid for One thousand and ninety-five days i.e. approximately three years from the date of issuance of such Certificate. The price of REC would be determined in power exchange**. REC would be traded in power exchange within the forbearance price and floor price determined by CERC from time to time. **Hence statement 3 is not correct.**

**Q 14.C**

- Prime Minister Narendra Modi announced that India has achieved its target of blending 10% sugarcane-extracted ethanol in petrol, ahead of schedule. India's aim is to increase this ratio to 20% originally by 2030 but in 2021, when NITI Aayog put out the ethanol roadmap, that deadline was advanced to 2025.
- Benefits of Ethanol blending include:
  - **Ethanol blending will help bring down our share of oil imports** (almost 85%) on which we spend a considerable amount of precious foreign exchange
  - Secondly, **more ethanol output would help increase farmers' incomes**. According to the Ministry of Petroleum and Natural Gas, ethanol blending led to the payment of over Rs 40,600 crore to farmers in the course of the last eight years.
  - An increase in the ethanol content in fuels reduced the emissions of some regulated pollutants such as carbon monoxide (CO), hydrocarbons (HC) and CO2.
  - **Hence option (c) is the correct answer.**

**Q 15.A**

- The 26th Conference of Parties to the United Nations Framework Convention on Climate Change (COP26) in Glasgow promoted discussions on climate change issues and solutions that resulted in the Glasgow Climate Pact, including commitments to strengthen efforts to build climate resilience and curb the emission of greenhouse gases.
- Based on such deliberations of CoP26, India's Prime Minister announced India's Panchamrit to accelerate the energy transition in India. **Furthermore, under the International Solar Alliance, India announced the launch of the Green Grids Initiative — One Sun, One World, One Grid (GGI-OSOWOG) in partnership with the United Kingdom.** This piece aims to highlight the challenges and opportunities of GGI in India. **Hence statement 2 is not correct.**
- GGI-OSOWOG was conceived in 2018 to develop global interconnected solar energy systems. In May 2021, India and the United Kingdom committed to launching GGI at CoP26.
- The initiative aims to build a framework for global cooperation on the effective utilisation of renewable resources and to help ensure that clean and efficient energy is a reliable option for all nations to meet their energy requirements by 2030. This project aspires to harness the sun's energy and build a global interconnected electricity grid to accelerate the transition to renewable energy.
- **The initiative is expected to connect more than 80 countries across a large geographical area, with varying levels of sunlight. A transitional system will enable countries with low levels of sunlight to obtain energy from areas with an excess of it. Hence statement 1 is correct.**

**Q 16.A**

- **The Supreme Court has questioned the Union government over "dragging its feet" from taking a stand on according the 'national monument' status to Ram Setu after the Centre sought more time to submit its affidavit in the matter.**
- Ram Setu, also known as Adam's bridge, is a chain of limestone shoals between Pamban Island or Rameswaram Island, off the southeastern coast of Tamil Nadu, and Mannar Island, off the northwestern coast of Sri Lanka. **Hence option (a) is the correct answer.**
- **The "bridge" is 30 miles (48 km) long and separates the Gulf of Mannar (southwest) from the Palk Strait (northeast).**
- National heritage status is sought in the backdrop of Sethusamudram Ship Channel project (SSCP) that envisages dredging of a ship channel across the Palk Straits between India and Sri Lanka.
- Significance of SSCP
    - Reduce steaming distances between east and west coasts of India.
    - Strengthen national security by improving navigation for Indian coast guards and naval ships

**Q 17.C**

- Environmental Impact Assessment is defined as an activity that has been designed to identify, predict and interpret the impact of an action on human health, including the well-being of the ecosystem on which the survival of human beings depends.
- **Environment Impact Assessment, 2006 in India is notified under the Environment Protection Act 1986** which contains various provisions on EIA methodology and process. **Hence, statement 1 is correct.**
- It is necessary to involve the public while making the Environment Impact Assessment. The planning reports and the projected environmental impacts are presented to the public. This is done by interacting with the community representatives or with a small group of people at the local level.
- The environmental clearance process for new projects consists of four stages, some of which may not be required for all projects. These four stages in sequential order are:
    - **Screening stage:** At the screening stage, the State level Expert Appraisal Committee (SEAC) reviews the application to determine whether the project requires further environmental studies for the preparation of an EIA report.
    - **Scoping stage:** At the scoping stage, detailed and comprehensive Terms of Reference (TOR) addressing all relevant environmental concerns for the preparation of an EIA report are determined. This is carried out by the Expert Appraisal Committee (EAC) for Category A projects and by the State-level Expert Appraisal Committee (SEAC) for Category B1 projects. Scoping is not required for B2 projects.
    - **Public Consultation stage:** This stage involves consultation with project-affected persons on the effects of the project. The concerns heard during the public consultation process must be addressed in the EIA report and in the Environmental Management Plan.
    - **Appraisal stage:** This stage sees the overall and detailed scrutiny of the final EIA report, which will have been presented to EAC or SEAC. The EAC or SEAC considers the environmental aspects of the

project and makes a recommendation to the Regulatory Authority on whether prior EC should be granted or not.

- Recently, the Ministry of Environment, Forests and Climate Change has notified amendment to the Environment Impact Assessment (EIA) Rules, **exempting highway projects of strategic and defence importance, which are 100 km from the Line of Control, among other locations, from an environmental clearance before construction. Hence statement 2 is correct.**

**Q 18.A**

- **Union government has infused about ₹5,000 crore in Special Window for Completion of Affordable and Mid-Income Housing (SWAMIH) Investment Fund.**
- In order to give relief to homebuyers of stalled projects, a Special Window for Completion of Affordable and Mid-Income Housing (SWAMIH investment fund) has been created for **funding stalled projects that are net-worth positive, including those projects that have been declared as Non-Performing Assets (NPAs)** or are pending proceedings before the National Company Law Tribunal under the Insolvency and Bankruptcy Code. SWAMIH investment fund will provide last mile funding to the stressed affordable and middle-income housing projects in the country, **Hence statement 1 is correct.**
- SWAMIH Fund aims to provide priority debt financing to complete stressed, brownfield and RERA-registered residential projects.
- It is a **category II Alternative Investment Fund (AIF)** announced in 2019. **Hence statement 2 is correct.**
- **It is sponsored by the Ministry of Finance and managed by SBICAP Ventures,** a unit of State Bank of India. **Hence statement 3 is not correct.**
- **Additional Information:** As per the Securities and Exchange Board of India, AIFS are divided into three categories. They are as follows:
- **Category 1 AIFS:** These funds are invested in businesses that are new or have the potential to grow financially such as Startups, Small and Medium Enterprises. The government encourages investments in these ventures as they have a positive impact on the economy with regards to high output and job creation.
    - Examples of this category are as follows: Infrastructure Funds; Angel Funds; Venture Capital Funds; Social Venture Funds
- **Category 2 AIFS:** Under this category, funds that are invested in equity securities and debt securities are included. Those funds not already under Category 1 and 3 respectively are also included. No concession is given by the government for any investment made for Category 2 AIFS
    - Examples of this category are as follows: Fund of Funds; Debt Funds; Private Equity Funds
- **Category 3 AIFS:** These are those funds which give returns under a short period of time. These funds use complex and diverse trading strategies to achieve their goals. There is no known concession or incentive given towards these funds specifically by the government
    - Examples of this category are as follows: Hedge Funds, Private Investment in Public Equity Funds

**Q 19.A**

- **Black carbon (BC)** is a component of fine particulate matter. Black carbon **consists of pure carbon** in several linked forms. It is formed through the **incomplete combustion of fossil fuels, biofuel, and biomass,** and is emitted in both anthropogenic and naturally occurring soot.
- The composition of black carbon varies by the type of fuel used, the combustion process, and emission control technologies or practices. Black carbon particles vary in size and can be much smaller than PM2.5 and as small as PM0.1. Depending on the region, the **atmospheric residence time for black carbon** emissions from different regions varies between 4.6 to 7.3 days — in other words, it stays in the air for a period of **days to weeks** instead of more than a hundred years, as is the case with CO2. **Hence statement 3 is correct.**
- Black carbon adds to global warming in two ways. First, when soot enters the atmosphere, it **absorbs sunlight and generates heat, warming the air.** Second, when soot settles on snow and ice, it makes the surface darker, so the **surface absorbs more sunlight and generates heat**. This warming causes more snow and ice to melt, in which can be a vicious cycle. Black carbon on glacial snow is a concern as it alters the melt cycle of glaciers in regions that rely on glacial melt to balance water supply through seasons. The Arctic and the Himalayas are therefore vulnerable.
- Black carbon **lowers the albedo of a surface.** The term "albedo" used to indicate the amount of energy reflected by a surface. Soot is dark in color, and so has a low albedo and reflects only a small fraction of the Sun's energy. **Hence statement 2 is not correct.**
- But black carbon that hangs **above low-lying clouds has a different effect.** It stabilizes the layer of air on top of the clouds, promoting their growth. These clouds **are like shields, blocking incoming sunlight**. As a result, black carbon also ends up **cooling the planet. Hence statement 1 is correct.**

**Q 20.B**

- **The Waste to Wealth Mission is one of the nine scientific missions of the Prime Minister's Science, Technology, and Innovation Advisory Council (PMSTIAC). The mission is spearheaded by the office of the Principal Scientific Adviser (PSA), Government of India.** The mission aims to identify, develop, and deploy technologies to treat waste to generate energy, recycle materials, and extract resources of value. The mission will also work to identify and support the development of modern technologies that promise to create a clean and green environment. **Hence, statement 1 is not correct.**
- The mission will assist and augment the Swachh Bharat and Smart Cities projects to create circular economic models that are financially viable for waste management to streamline waste handling in the country.
- **The Government of India under its "Waste to Wealth" Mission announced the "Swachhta Saarthi Fellowship 2022" to empower young innovators** who are engaged in community work of waste management, waste awareness campaigns, waste surveys, etc. as Swachhta Saarthis and implement actions to reduce waste for a greener planet. **Hence statement 2 is correct.**

**Q 21.D**

- **Recent Context: The Ministry of Coal and the Ministry of Mines jointly held the Investors' conclave on commercial coal mines auction and opportunities in mining sector.**
- Ministry of Coal has started commercial auction of coal mines on revenue share basis. In order to arrive at the revenue share based on market prices of coal, one National Coal Index (NCI) is conceptualized.
- The NCI is a price index which reflects the **change of price level of coal on a particular month relative to the fixed base year**. **Hence statement 1 is not correct.**
- The base year for the NCI is **FY 2017-18**. **Hence statement 2 is not correct.**
- NCI is a price index combining the prices of coal from all the sales channels- **Notified Prices, Auction Prices and Import Prices**.
- The amount of revenue share per tonne of coal produced from auctioned blocks would be arrived at using the NCI by means of defined formula.
- The Index is meant to encompass **all transactions of raw coal in the Indian market**. This includes coking and non-coking of various grades transacted in the regulated (power and fertilizer) and non-regulated sectors. Washed coal and coal products are not included.
- NCI has been rolled out on 4th June 2020 and the aim is to have an index that will truly reflect the market price.
- NCI is composed of a set of five sub-indices, three for Non Coking Coal and two for Coking Coal.
    - The three sub-indices for Non Coking Coal are combined to arrive at the Index for Non Coking Coal and
    - the two sub-indices for Coking Coal are combined to arrive at the Index for Coking Coal. Thus, indices are separate for Non-coking and Coking Coal.
- As per the grade of coal pertaining to a mine, the appropriate sub-index is used to arrive at the revenue share.
- **The concept and design of the Index as well as the Representative Prices have been developed by the Indian Statistical Institute, Kolkata.**
- **The National Coal Index is released every month.**

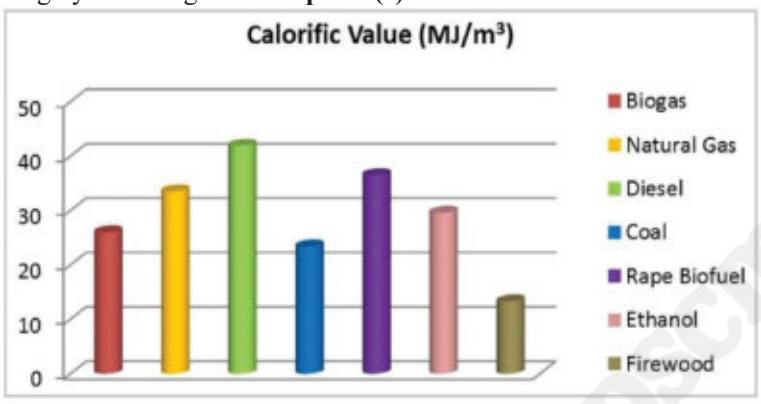
**Q 22.C**

- Geothermal energy is heat within the earth. The word geothermal comes from the Greek words geo (earth) and therme (heat). Geothermal energy is a renewable energy source because heat is continuously produced inside the earth.
- A geothermal heat pump system can take advantage of the constant temperature of the upper ten feet (three meters) of the Earth's surface to heat a home in the winter while extracting heat from the building and transferring it back to the relatively cooler ground in the summer.
- Geothermal energy is generated in over 20 countries. **The United States is the world's largest producer** and the largest geothermal development in the world is the Geysers north of San Francisco in California. In Iceland, many of the buildings and even swimming pools are heated with geothermal hot water. **Hence statement 1 is correct.**
- **According to the ministry of new and renewable energy**, India has the potential to generate 10,000 (10 GW) geothermal power. **Hence statement 2 is correct.**
    - In 2021, the Oil and Natural Gas Corporation Energy Centre (OECT) and the Iceland Geosurvey (ISOR), have signed a memorandum of understanding (MoU) **for developing India's first geothermal plant in Puga, Ladakh.** Recently, ONGC started drilling at the remote valley located at an altitude of

14,000 feet and has hit upon high-pressure steam at 100 degree Celsius with a discharge of 100 tonnes of geothermal energy per hour.
    - The promising geothermal sites for direct heat use applications are Rajgir in Bihar, Manikaran in Himachal Pradesh, Surajkund in Jharkhand, Tapoban in Uttarakhand & Sohana region in Haryana.
- There are many advantages of geothermal energy. Unlike solar and wind energy, geothermal energy is always available, 365 days a year. It can be extracted without burning a fossil fuel such as coal, gas, or oil. **Geothermal fields produce only about one-sixth of the carbon dioxide that a relatively clean natural-gas-fueled power plant produces. Hence statement 3 is not correct.**
- But it has some environmental problems. The main concern is the release of hydrogen sulfide, a gas that smells like rotten egg at low concentrations. Another concern is the disposal of some geothermal fluids, which may contain low levels of toxic materials.

**Q 23.C**

- Biogas is produced when bio-degradable organic materials/wastes such as biomass from farms, gardens, kitchens, industry, and municipal wastes are subjected to a scientific process, called Anaerobic Digestion (A.D.) in Biogas Plants.
- **Biogas is the mixture of gases (primarily methane (CH4) and Carbon di-oxide (CO2)** and traces of Hydrogen Sulfide (H2S), Moisture). It contains about 55-65 % of methane, 35- 44 % of carbon dioxide and traces of other gases, such as Hydrogen Sulphide, Nitrogen and Ammonia.
- Biogas is an excellent fuel as it contains methane. **It burns without smoke and leaves no residue** like ash in wood, charcoal and coal burning.
- Biogas, in its raw form, that is without any purification, can be used as clean cooking fuel like LPG, lighting, motive power and generation of electricity. **It can be used in diesel engines to substitute diesel up to 80%** and up to 100% replacement of diesel by using 100% Biogas Engines.
- The average calorific value of biogas is 20 MJ/m3 (4713 kcal/m3). The calorific value of diesel fuel is roughly 40 MJ/kg. **Hence option (c) is the correct answer.**



Calorific Value of Biogas and Traditional Fuels

**Q 24.B**

- Under the plan scheme "Metropolitan Advisories for Cities for Sports, Tourism (Metropolitan Air Quality and Weather Services), **Ministry of Earth Sciences (MoES),** Govt. of India, has introduced a major national initiative, **"System of Air Quality and Weather Forecasting and Research" known as "SAFAR". Hence, statement 1 is not correct.**
- **It is for greater metropolitan cities of India to provide location specific information on air quality in near real time and its forecast 1-3 days in advance for the first time in India.** It has been **combined with the early warning system on weather parameters.**
- The SAFAR system is **developed indigenously by Indian Institute of Tropical Meteorology, Pune**, along with ESSO partner institutions namely India Meteorological Department (IMD) and National Centre for Medium Range Weather Forecasting (NCMRWF). **Hence, statement 2 is correct.**
- The implementation of SAFAR is made possible with an active collaboration with local municipal corporations and various local educational institutions and governmental agencies in that Metro city.
- The ultimate **objective of the project is to increase awareness among general public regarding the air quality in their city well in advance** so that appropriate mitigation measures and systematic action can be taken up for betterment of air quality and related health issues.
- It engineers **awareness drive by educating public, prompting self-mitigation** and also to help develop mitigation strategies for policy makers.

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- This SAFAR project involves **4 components to facilitate the current and 24 hour advance forecasting.**
  - the development of emission inventory of air pollutants for NCR and defining air quality index for India,
  - **network of eleven Air Quality Monitoring Stations (AQMS) equipped with 11 automatic weather stations to provide near real time air quality information,**
  - 3-D atmospheric chemistry transport forecasting modeling coupled with weather forecasting model to provide 24 hour advance forecast of air pollutant levels and
  - **Display on LED and LCD screens** located at 20 different locations in Delhi in a public friendly format.
  - **Hence, statement 3 is correct.**

**Q 25.B**

- **Indian Space Research Organisation (ISRO) and Social Alpha** signed an MoU to launch **SpaceTech Innovation Network (SpIN),** India's first dedicated platform for innovation curation and venture development for the burgeoning space entrepreneurial ecosystem. **Hence option (b) is the correct answer.**
- A one-of-its-kind public-private collaboration for start-ups and SMEs in the space industry, this novel partnership is a significant step forward in providing further stimulus to India's recent space reform policies and will work towards identifying and unleashing the market potential of the most promising space tech innovators and entrepreneurs in India.
- SpIN will primarily focus on facilitating space tech entrepreneurs in three distinct innovation categories: Geospatial Technologies and Downstream Applications; Enabling Technologies for Space & Mobility; and Aerospace Materials, Sensors, and Avionics.
- **Social Alpha is a multistage innovation curation and venture development platform for science and technology start-ups** that address the most critical social, economic, and environmental challenges through the power of entrepreneurship and market-creating innovations. Since its inception in 2016, Social Alpha has supported more 200 start-ups including 60+ seed investments.

**Q 26.A**

- **Recently, Razorpay, a payments and banking platform, announced its readiness to support credit card transactions on Unified Payments Interface (UPI), claiming it was an industry-first move.**
- Now, with RuPay credit cards being enabled on UPI, **Razorpay merchants would be able to accept credit card payments on UPI**, with minimal changes to their existing set-up. This disruption was made possible in partnership with Axis bank. **Hence statement 3 is not correct.**
- **Unified Payments Interface (UPI) is a system that powers multiple bank accounts into a single mobile application (of any participating bank), merging several banking features, seamless fund routing & merchant payments into one hood**. It also caters to the "Peer to Peer" collect request which can be scheduled and paid as per requirement and convenience. **Hence statement 1 is correct.**
- UPI is a real-time payment system, launched in 2016 by National Payments Corporation of India. **Hence statement 2 is correct.**
- Some features of UPI are as follows:
  - Immediate money transfer through mobile device round the clock 24*7 and 365 days.
  - Single mobile application for accessing different bank accounts.
  - Single Click 2 Factor Authentication – Aligned with the Regulatory guidelines, yet provides for a very strong feature of seamless single click payment.
  - Virtual address of the customer for Pull & Push provides for incremental security with the customer not required to enter the details such as Card no, Account number; IFSC etc.
  - QR Code
  - Best answer to Cash on Delivery hassle, running to an ATM or rendering exact amount.
  - Utility Bill Payments, Over the Counter Payments, QR Code (Scan and Pay) based payments.
  - Raising Complaint from Mobile App directly.

**Q 27.B**

- **Petroplants are plants that follow certain metabolic pathways that produce hydrocarbon products similar to petroleum. These plants provide liquid hydrocarbons as a substitute for liquid fuels.** The hydrocarbons present in these plants can be converted to petroleum hydrocarbons. **Hence statement 1 is correct.**
- **The petro plants have lactiferous canals in their stem and secrete a milky latex. T**he latex can be either continuously tapped like Havea latex and stored or extracted from the biomass by using the organic solvents. The product richin hydrocarbon is called as "biocrude". Biocrude yields about 70.6% energy;out of which 22% as kerosene and 44.6% as gasoline. **Hence statement 2 is correct.**

- Calotropis procera, Pedillanthus macrocarpus, Copifera langsdorfii, and **Jatropha curcas** are examples of petro-crops. Certain tree species, suchas Copaifea landsdorfii and Copaifea nultijuga are rich in oil. A single tree can give as much as 20-30 litres of oil in 2-3 hours in a single tapping. **Hence statement 3 is correct.**
    - Villagers in India use Jatropha oil can be an efficient and environmentally clean substitute for diesel. In the Philippines, bamboo tube-filled ignited fruits of petroleum nut (Pittosporum) are used as a torch light.

**Q 28.B**

- In 1995 the United Nations Environment Programme expanded its research and investigation on highly toxic persistent organic pollutants (POPs) with an initial focus on what became known as the "Dirty Dozen".
- **The Stockholm Convention is a global treaty that aims to protect human health and the environment from the effects of POPs. Initially, the treaty covers these dirty dozen compounds. These were a group of 12 highly persistent and toxic chemicals: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, polychlorinated biphenyls, polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, and toxaphene.** Many of the pesticides in this group are no longer used for agricultural purposes but a few continue to be used in developing countries. **Hence option (b) is the correct answer.**
- **The Stockholm Convention, which currently regulates 29 POPs, requires parties to adopt a range of control measures to reduce and, where feasible, eliminate the release of POPs.** For intentionally produced POPs, parties must prohibit or restrict their production and use, subject to certain exemptions such as the continued use of DDT. The Stockholm Convention also requires parties to restrict trade in such substances.
- **For unintentionally produced POPs, the Stockholm Convention requires countries to develop national action plans to address releases and to apply "Best Available Techniques" to control them.** The Stockholm Convention also aims to ensure the sound management of stockpiles and wastes that contain POPs.

**Q 29.D**

- **Nagoya Protocol:** The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity is an international agreement which aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way. It provides a transparent legal framework for the effective implementation of one of the three objectives of the Convention on Biological Diversity. **Hence pair 1 is not correctly matched.**
    - The Access and Benefit-sharing Clearing-House (ABS Clearing-House) is a platform for exchanging information on access and benefit-sharing established by Article 14 of the Protocol. The ABS Clearing House is a key tool for facilitating the implementation of the Nagoya Protocol, by enhancing legal certainty and transparency on procedures for access and benefit-sharing, and for monitoring the utilization of genetic resources along the value chain.
- **Kyoto Protocol:** The Kyoto Protocol was adopted on 11 December 1997. The Kyoto Protocol operationalizes the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition to limit and reduce greenhouse gases (GHG) emissions in accordance with agreed individual targets. **Hence pair 2 is not correctly matched.**
    - The Convention itself only asks those countries to adopt policies and measures on mitigation and to report periodically. It only binds developed countries and places a heavier burden on them under the principle of "common but differentiated responsibility and respective capabilities", because it recognizes that they are largely responsible for the current high levels of GHG emissions in the atmosphere. The objectives of Kyoto mechanisms:
        - ✓ Stimulate sustainable development through technology transfer and investment
        - ✓ Help countries with Kyoto commitments to meet their targets by reducing emissions or removing carbon from the atmosphere in other countries in a cost-effective way
        - ✓ Encourage the private sector and developing countries to contribute to emission reduction efforts
- **Rotterdam Convention:** The Convention creates legally binding obligations for the implementation of the Prior Informed Consent (PIC) procedure. It was built on the voluntary PIC procedure, initiated by UNEP and FAO. The Convention covers pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons by Parties and which have been notified by Parties for inclusion in the PIC procedure. **Hence pair 3 is not correctly matched.**

- Objectives of the Convention:
  - ✓ to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm;
  - ✓ to contribute to the environmentally sound use of those hazardous chemicals, by facilitating information exchange about their characteristics, by providing for a national decision-making process on their import and export and by disseminating these decisions to Parties.
- **Hence option (d) is the correct answer.**

**Q 30.D**

- The National Mission for Enhanced Energy Efficiency (NMEEE) is one of the eight national missions under the National Action Plan on Climate Change (NAPCC). NMEEE aims to strengthen the market for energy efficiency by creating conducive regulatory and policy regimes and has envisaged fostering innovative and sustainable business models to the energy efficiency sector.
- NMEEE consist of four initiatives to enhance energy efficiency in energy-intensive industries which are as follows:
  - **Perform Achieve and Trade Scheme (PAT)** - Implementing a market-assisted compliance mechanism to accelerate the implementation of cost-effective improvements in energy efficiency in large energy-intensive industries.
  - **Market Transformation for Energy Efficiency (MTEE)** - Accelerating the shift to energy-efficient appliances in the specific applications through innovative measures to make the products more affordable.
  - **Energy Efficiency Financing Platform (EEFP)** - Facilitating Financial Institutions to invest in Energy Efficiency Projects and Programmes
  - **Framework for Energy Efficient Economic Development (FEEED)** - Developing fiscal instruments to leverage financing for Energy Efficiency through risk mitigation:
    - ✓ Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) and
    - ✓ Venture Capital Fund for Energy Efficiency (VCFEE) to promote energy efficiency
    - ✓ National Energy Conservation Award and Painting Competition
- BEE - Bureau of Energy Efficiency and EESL - Energy Efficiency Services Limited are the implementing agencies of National Mission for Enhanced Energy Efficiency.
- **As part of the National Electric Mobility Mission Plan (NEMMP), 2020,** Department of Heavy Industry formulated a Scheme viz. Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) Scheme in the year 2015 to promote manufacturing of electric and hybrid vehicle technology and to ensure sustainable growth of the same. **Hence option (d) is the correct answer.**

**Q 31.D**

- **C40 is a network of mayors of 97 world-leading cities** collaborating to deliver the urgent action needed right now to confront the climate crisis. It is a conference where city leaders from around the world share ideas on green urban development, and on ways to get national governments to act on climate issues. **Apart from Mayors and Deputy Mayors, the Summit is being attended by climate experts**, influencers, business leaders, innovators, changemakers, and citizens.
- **C40 was founded in 2005.** In 2005, mayor of London Ken Livingstone convened representatives from 18 megacities to forge an agreement on cooperatively reducing climate pollution and created the 'C20'. By **2006**, the C40 Steering Committee invited a further 22 mayors to join, **ensuring balance from the Global South, creating an organisation of 40 cities,** and thus the name C40.
- **C40's Leadership Standards for 2021-2024** went into effect in 2021, setting an ambitious standard for C40 cities to ensure they are on a path to a zero-carbon future. Two new collaborative groups were launched;
  - the **Global Mayors Task Force on Climate and Migration** to address the impact of the climate crisis on migration in cities,
  - and the first-of-its-kind **Global Youth and Mayors Forum**, which brings together youth climate leaders and mayors to work together on shaping the vision of a Global Green New Deal.
- **Recently Ahmedabad joined C40 as a mega city member to accelerate climate resilience and sustainable development.** C40's Steering Committee approved Ahmedabad's membership application on June 30. The city is the tenth to join C40 from South and West Asia, and the sixth from India. **Other cities from India under C40 are Delhi, Mumbai, Chennai, Bengaluru and Kolkata. Hence, option (d) is the correct answer.**

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**Q 32.C**

- **The permafrost carbon feedback (PCF) is the amplification of global warming due to CO2 and CH4 emissions from thawing permafrost. An analysis of available estimates of PCF strength and timing indicates 120 ± 85 Gt of carbon emissions from thawing permafrost by 2100.** Despite such large effects, climate projections in the IPCC Fifth Assessment Report (AR5), and any emissions targets based on those projections, do not adequately account for emissions from thawing permafrost and the effects of the PCF on global climate.
- **Thermokarst lakes are especially effective in inducing rapid thaw of permafrost, with subsequent release of substantial amounts of CH4, which is 33 times more effective greenhouse gas than CO2. The release of CO2 and CH4 from thawing permafrost will amplify global warming due to anthropogenic greenhouse gas emissions and further accelerate permafrost degradation.**
- Warmer conditions and increased atmospheric CO2 will enhance plant growth that will remove some CO2 from the atmosphere, but this may only partially compensate for the much greater carbon losses from thawing permafrost.
- **The PCF is irreversible on human time scales because in a warming climate, the burial mechanisms described above slow down or stop, so there is no way to convert CO2 into organic matter and freeze it back into the permafrost.** Degrading permafrost can alter ecosystems, damage infrastructure, and release enough carbon dioxide (CO2) and methane (CH4) to influence the global climate. **Hence option (c) is the correct answer.**

**Q 33.B**

- **Ocean acidification** is the change in ocean chemistry - lowering of ocean pH (i.e. increase in concentration of hydrogen ions) driven by the uptake of carbon compounds by the ocean from the atmosphere. As the **uptake of atmospheric carbon dioxide by the ocean increases, the concentration of hydrogen ions in the ocean increases,** the concentration of carbonate ions decreases, the pH of the oceans decreases and the oceans become less alkaline – this process is know as ocean acidification. **Hence statement 2 is not correct.**
- The **ocean's average pH is now around 8.1,** which is **basic** (or alkaline), but as the ocean continues to absorb more CO2, the pH decreases and the ocean becomes more acidic. It is **nearly impossible,** chemically, for all of it to actually **become a pH less than 7.0.** Ocean acidification is the direction of travel, the trend, regardless of the starting point. **Hence statement 1 is not correct.**
- Deep, cold ocean waters are naturally under saturated with carbonate ions causing the shells of most calcifying organisms to dissolve. Surface waters are over saturated with carbonate ions and do not readily dissolve shells of calcifying organisms. The saturation horizon is the level below which calcium carbonate minerals undergo dissolution. Those organisms that can survive below the saturation horizon do so due to special mechanisms to protect their calcium carbonate from dissolving. **As ocean acidification causes this horizon to rise vertically in the water column (shallowing the saturation horizon)** so more and more calcifying organisms will be exposed to under saturated water and thus vulnerable to dissolution of their shells and skeletons. **Hence statement 3 is correct.**
- This makes it more **difficult for marine organisms, such as coral and some plankton, to form their shells and skeletons**, and existing shells may begin to dissolve. **Crustaceans and corals** need carbonate ions to help them build strong shells. In their absence, it becomes difficult for crabs, oysters and clams to build shells due to the saline effects of ocean acidification. It also stops corals from building strong skeletons and it weakens plankton.

**Q 34.C**

- Eutrophication is the process in which a **water body becomes overly enriched with nutrients, leading to plentiful growth of simple plant life.** The excessive growth (or bloom) of algae and plankton in a water body are indicators of this process. Eutrophication is considered to be a serious environmental concern since it often results in the **deterioration of water quality and the depletion of dissolved oxygen in water bodies.** Eutrophic waters can eventually become "dead zones" that are incapable of supporting life.
- The availability of nutrients such as nitrogen and phosphorus limits the growth of plant life in an ecosystem. When water bodies are overly enriched with these nutrients, the growth of algae, plankton, and other simple plant life is favoured over the growth of more complex plant life.
- **Oligotrophic lakes carry low levels of nutrients; have lower productivity and clear water. Oligotrophic lakes carry a very large amount of oxygen while eutrophic lakes carry very low amounts of oxygen. Water is usually clear, non-turbid or of very low turbidity in an oligotrophic lake. Thus, Eutrophication is not possible in these lakes. Hence, statement 2 is not correct.**

- **Eutrophic lakes have a high level of biological productivity.** Such lakes support a plethora of plants due to their high nutrient content, particularly nitrogen and phosphorus. When a water body is "fed" too many nutrients, notably phosphate and nitrogen, eutrophic conditions develop. **Eutrophication can happen naturally or as a result of human activity in the environment.**
- As with many other aquatic plants, **duckweeds grow best in water with high levels of nitrogen and phosphate. Eutrophication of a body of water can produce these conditions and encourages the growth of duckweeds. The floating aquatic macrophyte, water hyacinth also takes advantage of these nutrient rich systems, becoming highly invasive and damaging. Hence, statement 3 is correct.**
- Eutrophication is a natural process that results from accumulation of nutrients in lakes or other bodies of water. Since this accumulation is not possible in a flowing water body, **Hence, Statement 1 is not correct.**

**Q 35.A**

- **The Climate Ambition Alliance brings together countries, businesses, investors, cities, and regions that are working towards achieving net-zero CO2 emissions by 2050.** Country engagement in this Alliance is led by the governments of Chile and the United Kingdom, with support from UN Climate Change and UNDP.
- **In addition to the 120 member countries, the European Union is also part of this initiative. All efforts of the alliance aim to accelerate the necessary transformation to reach the goals of the Paris Agreement and stabilize the global temperature rise to 1.5°C.** This commitment also includes regions, cities, companies, and investments**. All members of the alliance are committed to the goal of achieving carbon neutrality by 2050. Hence statement 1 is correct.**
- **The objective of the alliance is to build momentum around the shift to decarbonized economies where governments must strengthen their contributions to the Paris Agreement.** This will send governments a resounding signal that businesses, cities, regions, and investors are united in meeting the Paris goals and creating a more inclusive and resilient economy.
- **India is the world's fourth biggest emitter of carbon dioxide after China, the US, and the EU. India has promised to cut its emissions to net zero by 2070 - missing a key goal of the COP26 Glasgow summit for countries to commit to reaching that target by 2050. So India has opted out of the alliance. Hence statement 2 is not correct.**
- To mobilize non-state actors to credibly join the Climate Ambition Alliance, the Race to the Zero campaign was launched on 5 June 2020. The Race To Zero campaign mobilizes actors outside of national governments to join the Climate Ambition Alliance. In doing so Race To Zero rallies leadership and support from businesses, cities, regions, and investors for a healthy, resilient, zero-carbon recovery from COVID-19 that prevents future threats, creates decent jobs, and unlocks inclusive, sustainable growth.

**Q 36.D**

- Eutrophication is the process in which a water body becomes overly enriched with nutrients, leading to plentiful growth of simple plant life. The excessive growth (or bloom) of algae and plankton in a water body are indicators of this process.
- Eutrophication is considered to be a serious environmental concern since it often results in the deterioration of water quality and the depletion of dissolved oxygen in water bodies. Eutrophic waters can eventually become “dead zones” that are incapable of supporting life.
- The availability of nutrients such as nitrogen and phosphorus limits the growth of plant life in an ecosystem. When water bodies are overly enriched with these nutrients, the growth of algae, plankton, and other simple plant life is favoured over the growth of more complex plant life.
- Algal blooms result from eutrophication. When algae die, microorganisms begin to breakdown the organic stuff left behind. These bacteria require a lot of oxygen to survive. This raises the biological oxygen demand, or BOD, in the water body and decrease dissolved oxygen, resulting in hypoxia. **Hence, option 2 is not correct.**
- Some eutrophication indicators are visible to the human eye and some are invisible. Fish kills, and poor water clarity are the visible indicators citizens will recognize. **Hence, option 3 is correct.**
- While nutrients, dissolved oxygen, turbidity, and Chlorophyll-a concentrations are measurable indicators managers and scientists monitor. Increase in Chlorophyll-a is considered a direct effect or primary symptom of eutrophication, and is among the most common Earth Observations made by satellite. **Hence, option 1 is correct.**

**Q 37.D**

- **Recently, the World Malaria Report 2022 was released by World Health Organisation (WHO).**
- Malaria is an acute febrile illness caused by **Plasmodium parasites (protozoa)**, which are spread to people through the bites of infected female Anopheles mosquitoes. **Hence statement 1 is not correct.**
    - There are **5 parasite species that cause malaria in humans**, and **2 of these species – P. falciparum and P. vivax – pose the greatest threat.**
        - ✓ P. falciparum is the deadliest malaria parasite and the most prevalent on the African continent.
        - ✓ P. vivax is the dominant malaria parasite in most countries outside of sub-Saharan Africa.
    - The first symptoms – fever, headache and chills – usually appear 10–15 days after the infective mosquito bite and may be mild and difficult to recognize as malaria. Left untreated, P. falciparum malaria can progress to severe illness and death within a period of 24 hours.
    - Vector control is a vital component of malaria control and elimination strategies as it is highly effective in preventing infection and reducing disease transmission.
    - The 2 core interventions are insecticide-treated nets (ITNs) and indoor residual spraying (IRS).
    - **Preventive chemotherapy** is the use of medicines, either alone or in combination, to prevent malaria infections and their consequences. It requires giving a full treatment course of an antimalarial medicine to vulnerable populations (generally infants, children under 5 years of age and pregnant women) at designated time points during the period of greatest malarial risk, regardless of whether the recipients are infected with malaria.
- **Dengue is a mosquito-borne viral disease**.
    - Dengue virus is transmitted by female mosquitoes mainly of the species **Aedes aegypti** and, to a lesser extent, **Ae. albopictus**.
    - **These mosquitoes are also vectors of chikungunya, yellow fever and Zika viruses.** Dengue is widespread throughout the tropics, with local variations in risk influenced by climate parameters as well as social and environmental factors. **Hence statement 2 is not correct.**

**Q 38.C**

- Recently, Bihar has opened India's first greenfield grain-based ethanol plant that will not discharge any waste, making it a zero-liquid discharge plant that is completely environment friendly.
- **Zero liquid discharge (ZLD)** is an e**ngineering approach to water treatment where all water is recovered and contaminants are reduced to solid waste**. It is achieved by stringing together water treatment technology that can treat wastewater as the contaminants are concentrated. **Hence option (c) is the correct answer.**
    - ZLD **obviates the risk of pollution associated with wastewater discharge** and **maximizes water usage efficiency**, thereby striking a balance between exploitation of freshwater resources and preservation of aquatic environments. Achieving ZLD, however, is generally characterized by intensive use of energy and high cost.
- **Carbon filtering** is a method of filtering that uses a bed of activated carbon to remove impurities from a fluid using adsorption.

**Q 39.B**

- The Global Methane Pledge was first announced in September by the **US and EU**. **Hence, statement 1 is not correct.**
- The aim is to reduce the global methane emissions across the globe which is to **cut down methane emissions by up to 30 per cent from 2020 levels by the year 2030.**
- How will the project help?
    - If implemented globally, this would **minimise global warming by 0.2 degrees Celsius by the 2040s,** compared to projected temperature rises.
- The planet is presently around 1.2 degrees Celsius hotter than it was before the Industrial Revolution.
- As of now, **India, the third-largest source of methane emissions, is not a signatory. Hence, statement 2 is correct.**
- Independent International Methane Emissions Observatory launched for Methane monitoring at COP26.
- **Over 90 countries have signed the Global Methane Pledge that was launched at the ongoing UN COP26 climate conference in Glasgow.**
- What is Methane?
    - It is the **second-most abundant greenhouse gas in the atmosphere, after carbon dioxide.**
    - It is a colourless, odourless, and highly flammable gas.

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- Sources:
  - ✓ These include human/anthropogenic sources and natural. Approximately **40% of methane emitted is from natural sources and about 60% comes from human-influenced sources.**
  - ✓ **Human sources/anthropogenic source**s of methane include landfills, oil and natural gas systems, agricultural activities, coal mining, wastewater treatment, and certain industrial processes. Human sources of methane are responsible for 60 per cent of global methane emissions.
  - ✓ The oil and gas sectors are among the largest contributors to human sources.
  - ✓ **Natural sources** include decay of plant material in wetlands, the seepage of gas from underground deposits or the digestion of food by cattle.

**Q 40.C**

- **There are three types of water Footprints:**
  - **Green water footprint:** It is water from precipitation that is stored in the root zone of the soil and evaporated, transpired or incorporated by plants. It is particularly relevant for agricultural, horticultural and forestry products.
  - **Blue water footprint:** It is water that has been sourced from surface or groundwater resources and is either evaporated, incorporated into a product or taken from one body of water and returned to another, or returned at a different time. Irrigated agriculture, industry and domestic water use can each have a blue water footprint.
  - **Grey water footprint: It is the amount of freshwater required to dilute the pollutants and meet specific water quality standards.** The Grey water footprint considers point-source pollution discharged to a freshwater resource directly through a pipe or indirectly through runoff or leaching from the soil, impervious surfaces, or other diffuse sources. **Hence, option (c) is the correct answer.**

**Q 41.A**

- The presence of a chemical or substance out of place and/or present at a higher-than-normal concentration that has adverse effects on any non-targeted organism is referred as "Soil pollution". The pollutants can be both natural and anthropogenic. Natural components of minerals when present in higher concentrations can become toxic.
- Original **rocks and the weathering processes can release metals and other contaminants in the soil**. Numerous soil parent resources are natural sources of heavy metals and other elements, such as radionuclides, and these can cause a hazard to the environment and human health at high concentrations. Arsenic (As) pollution is one of the main environmental problems around the world. **Natural sources of Arsenic comprise volcanic eruption and weathering** of As-bearing minerals and Ores, and zones of arsenopyrite (gossans), formed by weathering. **Hence, statement 1 is correct.**
- Metals present in the air can accumulate up to 1-2 inches of soil and tend to stay, due to their persistent nature. **Old orchards and agricultural lands may have more lead and arsenic** in the soil because of old insecticide residues. Likewise, soil next to heavy traffic may have higher lead levels because of exhaust from non-banned leaded gasoline. Phytoremediation is a **plant-based approach**, which involves the use of plants to extract and remove elemental pollutants or lower their bioavailability in soil (Berti and Cunningham, 2000). Plants have the ability to absorb ionic compounds in the soil even at low concentrations through their root system.
- **Mycoremediation is a form of bioremediation in which fungi-based remediation** methods are used to decontaminate the environment. **Hence, statement 2 is not correct.**
- Working with plants to clean up contaminated soil or water is called 'phytoremediation'.

**Q 42.A**

- **E-Waste (Management) Rules, 2016:** Looking at growing problems of e-waste, the Central Government in the exercise of the powers provided under Sections 6, 8 and 25 of the Environment (Protection) Act, 1986 has notified these rules.
  - Manufacturer, dealer, refurbisher and Producer Responsibility Organization (PRO) have been introduced as additional stakeholders in the rules.
  - The applicability of the rules has been extended to components, consumables, spares and parts of Electrical and Electronic Equipment. Compact Fluorescent Lamps (CFL) and other mercury-containing lamp brought under the purview of rules.
  - Collection mechanism based approach has been adopted to include collection centre, collection point, take back system etc for collection of e - waste by Producers under Extended Producer Responsibility (EPR).

- Provision for Pan India EPR Authorization by CPCB has been introduced replacing the state wise EPR authorization.
- **Every manufacturer has to maintain records of the e-waste generated, handled and disposed and make such records available for scrutiny by the concerned State Pollution Control Board. Hence statement 1 is correct.**
- Refurbishers are to collect e-waste generated during the process of refurbishing and channelise the waste to authorised dismantler or recycler through its collection centre.
- **Every manufacturer, producer, bulk consumer, collection centre, dealer, refurbisher, dismantler and recycler may store the e-waste for a period not exceeding one hundred and eighty days** and shall maintain a record of collection, sale, transfer and storage of wastes and make these records available for inspection:
- Provided that the concerned **State Pollution Control Board may extend the said period up to three hundred and sixty five days in case the waste needs to be specifically stored for development of a process for its recycling or reuse. Hence statement 2 is not correct.**
- State Government to prepare integrated plan for effective implementation of these provisions, and to submit annual report to Ministry of Environment, Forest and Climate Change.

**Q 43.C**

- **Recently a report, Grassroots Soldiers: Role of Asha's in Covid Management, was released.**
- ASHA workers are female community health workers instituted as community-based health functionaries under **National Rural Health Mission (NRHM)** launched in 2005. **Hence statement 1 is correct.**
- One of the key components of the National Rural Health Mission is to provide every village in the country with a trained female community health activist ASHA or Accredited Social Health Activist. Selected from the village itself and accountable to it, the ASHA will be trained to work as an interface between the community and the public health system.
- Following are the key components of ASHA :
  - ASHA must primarily be a woman resident of the village **married/ widowed/ divorced, preferably in the age group of 25 to 45 years. Hence statement 2 is correct.**
  - She should be a literate woman with due preference in selection to those who are qualified up to 10 standard wherever they are interested and available in good numbers. This may be relaxed only if no suitable person with this qualification is available.
  - ASHA will be chosen through a rigorous process of selection involving various community groups, self-help groups, Anganwadi Institutions, the Block Nodal officer, District Nodal officer, the village Health Committee and the Gram Sabha.
  - Capacity building of ASHA is being seen as a continuous process. ASHA will have to undergo series of training episodes to acquire the necessary knowledge, skills and confidence for performing her spelled out roles.

**Q 44.C**

- **India becomes the first Asian country to launch the India Plastics Pact which targets to enable businesses to transition towards a circular economy for plastics by 2030. This is an initiative between the Confederation of Indian Industry (CII) and WWF India to keep plastic packaging out of the natural environment. Hence statements 1 and 2 are correct.**
- The pact targets to be achieved by 2030 are:
  - define a list of unnecessary or problematic plastic packaging and items and take measures to address them through redesign and innovation.
  - 100% of plastic packaging to be reusable or recyclable.
  - 50% of plastic packaging to be effectively recycled.
  - 25% average recycled content across all plastic packaging.
- By stimulating new business models to reduce the total amount of plastic packaging, this pact also helps to build a stronger recycling system, ensuring that plastic packaging can be effectively recycled and made into new products.
- It brings together leading businesses at the national level to make commitments to building a circular system for plastics. It is supported by UK Research & Innovation (UKRI) and WRAP, a global NGO based in the UK.
- **The pact focused on recycling and reusability of plastic material and was not in favour of the total ban. India's Ministry of Environment, Forest, and Climate Change notified the Plastic Waste Management Amendment Rules, 2021 which mandated a ban from July 1, 2022, on the manufacturing, import, stocking, distribution, sale, and use of single-use plastic items.**

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- The list of banned items includes - earbuds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene (thermocol) for decoration, plastic plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping or packing films around sweet boxes, invitation cards, cigarette packets, plastic or PVC banners less than 100 micron, stirrers.

**Q 45.C**

- The Stockholm Convention is a global treaty to protect human health and the environment from persistent organic pollutants (POPs). POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife.
- The Stockholm Convention on Persistent Organic Pollutants was adopted on 22 May 2001 and entered into force on 17 May 2004.
- The Stockholm Convention's objectives include:
  - **Eliminating the production and use of specific POPs;**
  - Restricting the production and use of DDT only to disease vector control under WHO guidelines;
  - Restricting exports of POPs;
  - Developing strategies for identifying stockpiles of POPs and products containing POPs;
  - Taking measures to ensure that POPs wastes are managed and disposed of in an environmentally sound manner;
  - Developing strategies for identifying sites contaminated by POPs;
  - Ensuring that PCBs are managed in an environmentally sound manner and, by 2025, take action to remove PCBs from use;
  - Developing and implementing action plans to identify the sources and reduce releases of POPs byproducts; and
  - Identifying other chemicals with POPs characteristics and bringing them under the control of the Convention.
- Under the Convention, initially, twelve POPs have been recognized as causing adverse effects on humans and the ecosystem and these can be placed in 3 categories:
  - Pesticides: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene;
  - **Industrial chemicals: hexachlorobenzene, polychlorinated biphenyls (PCBs); and**
  - By-products: hexachlorobenzene; polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF), and PCBs.
- **The Global Environmental Facility (GEF) is the designated financial mechanism for the Stockholm Convention.** Article 14 of the Stockholm Convention entrusts the GEF as its financial mechanism. **Hence option (c) is the correct answer.**
- India had ratified the Stockholm Convention on January 13, 2006 as per Article 25(4), which enabled it to keep itself in a default "opt-out" position such that amendments in various Annexes of the convention cannot be enforced on it unless an instrument of ratification/ acceptance/ approval or accession is explicitly deposited with UN depositary. **The Cabinet delegated its powers to ratify chemicals under the Stockholm Convention to Union Ministers of External Affairs (MEA) and Environment, Forest and Climate Change (MEFCC) in respect of POPs already regulated under the domestic regulations thereby streamlining the procedure.**

**Q 46.B**

- The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention) **aims to conserve terrestrial, aquatic and avian migratory species throughout their range. Hence statement 1 is not correct.**
- The Convention has a membership of 133 Parties from Africa, Central and South America, Asia, Europe and Oceania. **It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme,** concerned with the conservation of wildlife and habitats on a global scale. **Hence statement 3 is not correct.**
- CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.
- **As the only global convention specializing in the conservation of migratory species, their habitats and migration routes,** CMS complements and co-operates with a number of other international organizations, NGOs and partners in the media as well as in the corporate sector. **Hence statement 2 is correct.**
- Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Besides establishing

obligations for each State joining the Convention, CMS promotes concerted action among the Range States of many of these species.

**Q 47.C**

- **Bioremediation is defined as the process whereby organic wastes are biologically degraded under controlled conditions to an innocuous state, or to levels below concentration limits established by regulatory authorities.** By definition, bioremediation is the use of living organisms, primarily microorganisms, to degrade environmental contaminants into less toxic forms. It uses naturally occurring bacteria and fungi or plants to degrade or detoxify substances hazardous to human health and/or the environment.
- **Most bioremediation systems are run under aerobic conditions, but running a system under anaerobic conditions may permit microbial organisms to degrade otherwise recalcitrant molecules. Hence, statement 1 is correct.**
- Bioremediation can be done in situ and ex situ. In situ techniques are defined as those that are applied to soil and groundwater at the site with minimal disturbance. Ex situ techniques are those that are applied to soil and groundwater at the site which has been removed from the site via excavation (soil) or pumping (water).
- **Bioventing is the most common in situ treatment and involves supplying air and nutrients through wells to contaminated soil to stimulate the indigenous bacteria. Whereas, Biosparging involves the injection of air under pressure below the water table to increase groundwater oxygen concentrations and enhance the rate of biological degradation of contaminants by naturally occurring bacteria. Hence, statement 2 is correct.**
- **Composting is an ex-situ method that involves combining contaminated soil with nonhazardous organic amendments such as manure or agricultural wastes.** The presence of these organic materials supports the development of a rich microbial population and elevated temperature characteristics of composting. **Hence, statement 3 is correct.**

**Q 48.C**

- **On the occasion of 164th birth anniversary of legendary Indian scientist Acharya Jagadish Chandra Bose and as part of Azadi Ka Amrit Mahotsava, Vijnana Bharati and Ministry of Culture, Govt. of India organized an "International conference on the contributions of J C Bose: A Satyagrahi Scientist".**
- Before the advent of the 20th century, science did not acknowledge the vitality of trees and plants. Then, on May 10, 1901, Jagadish Chandra Bose proved that plants are like any other life form.
    - Bose proved that plants have a definite life cycle, a reproductive system and are aware of their surroundings. The demonstration took place in the Royal Society in London, England.
    - **Bose used his invention to introduce the world of plants to the humans. His invention - the Crescograph - showed how plants move.**
    - The Bose Crescograph has a series of gears and a smoked glass plate that record the movement of a plant's tip under a magnetic scale of 1/10000
    - The plate catches the reflection of the plant and it was marked according to the movement of the plant. The plant was dipped in bromide, a poison. The pulse beat of the plant was shown as a light spot on the smoked plate. The spots became unsteady once the plant started to take in the poison, proving that plants have life.
    - Bose showed how plants behave differently under different environmental factors such as temperature, chemicals, electricity, gases, and humidity.
    - He showed the electrical nature of conduction among several stimuli in plants, which were earlier believed to have a chemical nature.
    - Bose was the first to study the action of microwaves in plant tissues and the changes in the plant cell membrane potential.
- In November 1895, Bose presented a public demonstration at Town Hall in Calcutta where he sent an electromagnetic wave across 75 feet, passing through walls to remotely ring a bell and to explode some gunpowder.
- He was considered as the **pioneer of Bengali science fiction.**
    - **His book 'Polatok Toofan' (Absconding Storm)** described how a cyclone could be averted by using a bottle of hair oil. It explained how oil changes the surface tension and holds water.
    - His book **'Niruddesher Kahini' (Story of the Untraceable) was the first major Bengali science fiction.**

- Jagadish Chandra Bose was one of the most influential teachers of his time. Two of his students were Meghnad Saha and Satyendra Nath Bose.
- There is a small crater on the moon named after Jagadish Chandra Bose. The Bose Crater is located at the far side of the moon close to Crater Bhabha and Crater Adler and has a diameter of 91 kilometres.
- **He used satyagraha as a tool against salary discrimination by the British in India.**
- **Hence option (c) is the correct answer.**

**Q 49.C**

- Recently the **Renewables 2022** report was released by **International Energy Association (IEA). Hence option (c) is the correct answer.**
- **Key findings of report:**
  - RE will comprise 90 percent of global electricity capacity expansion in next five years and much of it will be in India.
  - RE's installed power capacity addition will grow to 2,400 gigawatts (GW) between 2022 and 2027.
  - With addition of 145 GW, India is forecast to almost double its renewable power capacity over 2022-2027.
  - Solar photovoltaic accounts for three-quarters of this growth, followed by onshore wind (15 percent) and hydropower providing rest of it.

**Q 50.A**

- Ozone depleting substances are **man-made gases that destroy ozone once they reach the ozone layer.** The ozone layer sits in the upper atmosphere and reduces the amount of harmful ultra violet radiation that reaches Earth from the sun. Ultraviolet radiation can have detrimental effects on both humans and the environment. For instance **inducing skin cancer and cataracts, distorting plant growth and damaging the marine environment.**
- In the 1970s, concerns about the effects of ozone-depleting substances (ODS) on the stratospheric ozone layer prompted several countries, including the United States, to ban the use of chlorofluorocarbons (CFCs) as aerosol propellants. However, **global production of CFCs and other ODS continued to grow rapidly as new uses were found for these chemicals in refrigeration, fire suppression, foam insulation, and other applications.**
- ODS that release chlorine include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), **carbon tetrachloride,** and methyl chloroform. ODS that release bromine include halons and **methyl bromide. Hence statement 2 is correct.**
- **Natural sources of chlorine and bromine:** A few halogen source gases present in the stratosphere include **methyl chloride (CH3Cl) and methyl bromide (CH3Br),** both of which are emitted by **oceanic and terrestrial ecosystems.** In addition, very short-lived source gases containing bromine such as **bromoform (CHBr3) and dibromomethane (CH2Br2)** are also released to the atmosphere, primarily from **biological activity in the oceans. Volcanoes** provide an episodic source of reactive halogen gases that sometimes reach the stratosphere in appreciable quantities. Other natural sources of halogens include reactive chlorine and bromine produced by **evaporation of ocean spray. Hence statement 1 is correct.**
- **The Montreal Protocol on Substances that Deplete the Ozone Layer** is the landmark multilateral environmental agreement that regulates the production and consumption of nearly 100 man-made chemicals referred to as **ozone depleting substances (ODS).** When released to the atmosphere, those chemicals damage the stratospheric ozone layer, Earth's protective shield that protects humans and the environment from harmful levels of ultraviolet radiation from the sun. Adopted on 16 September 1987, **the Protocol is to date one of the rare treaties to achieve universal ratification. Hence statement 3 is not correct.**

**Q 51.B**

- **The Reserve Bank of India (RBI) has signed a Currency Swap Agreement with the Maldives Monetary Authority (MMA) under the SAARC Currency Swap Framework.** This is to provide swap support as a backstop line of funding for short-term foreign exchange liquidity requirements. This agreement will enable the MMA to make withdrawals in multiple tranches up to a maximum of USD 200 million from the RBI.
- **Currency Swap Agreement** between two countries is an agreement or contract to exchange currencies with predetermined terms and conditions.
- **SAARC Current Swap Facility came into operation in 2012** to provide a backstop line of funding for short-term foreign exchange liquidity requirements or balance of payment crisis till longer term arrangements are made. **Hence statement 1 is not correct.**
  - The withdrawals can be made in **US Dollar, Euro or Indian Rupee. Hence statement 2 is correct.**

- Under the Framework for 2019-22, RBI will continue to offer swap arrangement within the overall corpus of US $ 2 billion. The drawals can be made in US Dollar, Euro or Indian Rupee. The Framework provides certain concessions for swap drawals in Indian Rupee.
- The Currency Swap Facility will be available to all SAARC member countries, subject to their signing the bilateral swap agreements.

**Q 52.C**

- **In a first-of-its-kind detection, a team of astronomers has recorded a rare astronomical event involving a compact binary merger emitting long Gamma Ray Burst (GRB) twinned with kilonova emissions — a never before scientifically accepted or proven combination.**
  - Significantly, India's largest optical telescope — the 3.6 metres Devasthal Optical Telescope (DOT) — operated by Aryabhatta Research Institute of Observational Sciences (ARIES), Nainital, was among the key global telescopes that together confirmed this rare combination following an event.
- **GRBs are massive but extremely bright, high-energy short gamma radiations which get released when massive stars collapse or die in the Universe. Hence statement 1 is correct.**
- In fact, the energy associated with **GRBs is many folds larger than what our Sun can emit in its entire lifetime, making its study key to understanding the life and death of stars in our Universe. Hence statement 2 is not correct.**
- When a pair of binary compact systems — **either two blackholes, dense celestial bodies or neutron stars — rotate in a spiral fashion for billions of years, their ultimate merger leads to release of short GRBs. Hence statement 3 is correct.**
  - These emissions last for less than two seconds. And traditionally, kilonova — the radiations emerging from the merger of neutron stars or any binary system — has been associated with short GRBs.
- On the other hand, when very massive stars die, the event results in the release of long GRBs and the associated gamma radiations last for more than two seconds or longer. And scientists have, so far, associated short GRBs with supernovae.

**Q 53.B**

- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland, in response to a public outcry following the discovery, in the 1980s, in Africa and other parts of the developing world of deposits of toxic wastes imported from abroad.
- Awakening environmental awareness and corresponding tightening of environmental regulations in the industrialized world in the 1970s and 1980s had led to **increasing public resistance to the disposal of hazardous wastes – in accordance with what became known as the NIMBY (Not In My Back Yard) syndrome – and to an escalation of disposal costs.** This in turn led some operators to seek cheap disposal options for hazardous wastes in Eastern Europe and the developing world, where environmental awareness was much less developed and regulations and enforcement mechanisms were lacking. **It was against this background that the Basel Convention was negotiated in the late 1980s,** and its thrust at the time of its adoption was to combat the "toxic trade", as it was termed. The Convention entered into force in 1992. **Hence option (b) is the correct answer.**
- Objectives of Basel Convention:
  - The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics, as well as two types of wastes defined as "other wastes" - household waste and incinerator ash.
- The provisions of the Convention center around the following principal aims:
  - he reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;
  - the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management; and
  - a regulatory system applying to cases where transboundary movements are permissible.
- The Convention also provides for the establishment of regional or sub-regional centres for training and technology transfers regarding the management of hazardous wastes and other wastes and the minimization of their generation to cater to the specific needs of different regions and subregions (article 14). Fourteen such centres have been established. They carry out training and capacity building activities in the regions.

**Q 54.A**

- **The Bureau of Energy Efficiency (BEE) initiated the Standards & Labeling (S&L) programme for** equipment and appliances to provide the consumer an informed choice about energy saving and thereby the cost-saving potential of the relevant marketed product. **Hence statement 2 is not correct.**
- **The energy efficiency labelling programs under BEE are intended to reduce the energy consumption of appliance without diminishing the services it provides to consumers. Hence statement 1 is correct.**
- The scheme targets the display of energy performance labels on high energy end-use equipment & appliances and lays down minimum energy performance standards.
- Presently, S&L program covers star ratings for 29 appliances/equipment including Room Air Conditioners, Tubular Fluorescent Lamps, Color TV, Tyres etc.
- The Centre has recently launched the star labelling programme for tyres. The regulatory standard is administered by BEE which awards ratings based on the performance of domestically manufactured tyres in tests conducted by NABL accredited labs. **At present, BEE star labelling is in the voluntary phase.** It is likely that the star rating programme will become mandatory from January 2023.

**Q 55.C**

- **Two new plant species, namely Fimbristylis Sunilii and Neanotis Prabhuii, have been discovered in the Western Ghats region in Thiruvananthapuram and Wayanad districts in Kerala.**
- **Fimbristylis sunilii:** Fimbristylis sunilii, named after plant taxonomist C.N. Sunil, was collected from the grasslands of Ponmudi hills, Thiruvananthapuram. Fimbristylis sunilii, a perennial plant, belongs to the Cyperaceae family and is 20-59 cm tall.
- Neanotis prabhuii: It is a prostrate perennial herb named after K.M. Prabhukumar. Neanotis prabhuii was discovered in the Chembra Peak grasslands of Wayanad. Its petals are pale pink in color.
- **Denison barb (Miss Kerala)**
  - Miss Kerala is also known as Denison barb, red-line torpedo barb, and Roseline shark. **Hence option (c) is the correct answer.**
  - It is found in the States of Kerala and Karnataka.
  - It has been listed on the IUCN Redlist as Vulnerable, in 2010.
  - This species is known to inhabit fast-flowing hill streams and is often found in rocky pools with thick vegetation along river banks.
- **NOTE:** A section of aquarists and ornamental fish breeders are surprised that the Denison barb (Miss Kerala) has been included in Schedule I of the Wild Life (Protection) Amendment Bill, 2021.
  - **Why included in Schedule I of WPA?**
  - Ironically, its beauty is the biggest threat to its survival, as it is highly sought-after in the international aquarium trade, constituting 60 – 65% of the total live ornamental fish exported from India. Its numbers are also decreasing owing to habitat degradation due to deforestation, mining, agriculture, urban expansion and hydro-electric projects.

**Q 56.B**

- Recently, the Union Cabinet chaired by the Prime Minister approved India's updated Nationally Determined Contribution (NDC) to be communicated to the United Nations Framework Convention on Climate Change (UNFCCC).
- India at the 26th session of the Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC) held in Glasgow, United Kingdom, expressed to intensify its climate action by presenting to the world five nectar elements (Panchamrit) of India's climate action. This update to India's existing NDC translates the 'Panchamrit' announced at COP 26 into enhanced climate targets. The update is also a step towards achieving India's long-term goal of reaching net zero by 2070.
- Earlier, India submitted its Intended Nationally Determined Contribution (NDC) to UNFCCC on October 2, 2015. The 2015 NDC comprised eight goals; three of these have quantitative targets up to 2030 namely,
  - cumulative electric power installed capacity from non-fossil sources to reach 40%;
  - reduce the emissions intensity of GDP by 33 to 35 percent compared to 2005 levels and
  - **creation of an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover.**
- As per the updated NDC, **India now stands committed to reduce the Emissions Intensity of its GDP by 45 percent by 2030, from 2005 level** and achieve about **50 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030. Hence, option (b) is the correct answer.**
- The updated NDC reads "To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation, including through a mass movement for 'LIFE'– 'Lifestyle for Environment' as a key to combating climate change".

**Q 57.C**

- Ozone layer depletion is the **gradual thinning of the earth's ozone layer in the upper atmosphere** caused due to the release of chemical compounds containing gaseous bromine or chlorine from industries or other human activities.
- **Chlorofluorocarbons are the most abundant ozone-depleting substance.** It is only when the chlorine atom reacts with some other molecule, it does not react with ozone.
- **Montreal Protocol was proposed in 1987 to stop the use, production and import of ozone-depleting substances** and minimise their concentration in the atmosphere to protect the ozone layer of the earth.
- The depletion of the ozone layer has harmful effects on the environment.
- Let us see the **major effects of ozone layer depletion on man and environment.**
    - Ozone layer depletion increases the amount of UVB that reaches the Earth's surface. Laboratory and epidemiological studies demonstrate that **UVB causes non-melanoma skin cancer and plays a major role in malignant melanoma development.** In addition, UVB has been linked to the development of cataracts, a clouding of the eye's lens. **Hence, statement 3 is correct.**
    - **Phytoplankton form the foundation of aquatic food webs.** Phytoplankton productivity is limited to the euphotic zone, the upper layer of the water column in which there is sufficient sunlight to support net productivity. Exposure to solar UVB radiation has been shown to **affect both orientation and motility in phytoplankton**, resulting in reduced survival rates for these organisms. Scientists have demonstrated **a direct reduction in phytoplankton production due to ozone depletion-related increases in UVB. Hence, statement 2 is correct.**
    - Synthetic polymers, naturally occurring biopolymers, as well as some other materials of commercial interest are adversely affected by UVB radiation. Today's materials are somewhat protected from UVB by special additives. Yet, **increases in UVB levels will accelerate their breakdown, limiting the length of time for which they are useful outdoors. Hence, statement 1 is correct.**
    - Increases in UVB radiation could **affect terrestrial and aquatic biogeochemical cycles,** thus altering both sources and sinks of greenhouse and chemically important trace gases (e.g., carbon dioxide, carbon monoxide, carbonyl sulfide, ozone, and possibly other gases). These potential changes would contribute to biosphere-atmosphere feedbacks that mitigate or amplify the atmospheric concentrations of these gases.

**Q 58.A**

- The **Jawaharlal Nehru National Solar Mission (JNNSM), or the National Solar Mission,** is an initiative of the Government of India and State Governments to promote solar power in India.
    - Its objective is to establish **India as a global leader in solar energy by creating the policy conditions** for its deployment across the country
    - **JNNSM is one of the 8 components/parts of the National Action Plan for Climate Change. Hence statement 1 is correct.**
        - ✓ The **National Action Plan on Climate Change was released in 2008.** It outlines a national strategy that aims **to enable the country to adapt to climate change and enhance the ecological sustainability** of India's development path.
- The Mission adopts a **three-phase approach, Phase 1 (up to 2012 - 13), Phase 2 (2013 - 17), and Phase 3 (2017 - 22).** The immediate aim of the Mission is to **focus on setting up an enabling environment for solar technology penetration** in the country both at a centralized and decentralized level.
- **Target**
    - To create **100 GW (earlier target was 20 GW) solar power capacity by 2022** with an investment of around Rs. 6,00,000 cr. **Hence statement 2 is not correct.**
    - The target will **principally comprise 40 GW Rooftop and 60 GW through Grid Connected Solar Power Projects.**
    - The target also includes setting up **dedicated manufacturing capacities for polysilicon material** to annually make about **2 GW capacity of solar cells.**

**Q 59.B**

- **Salient features of Solid Waste Management Rules, 2016**
- The Rules are applicable beyond Municipal areas and extend to urban agglomerations, census towns, notified industrial townships, areas under the control of Indian Railways, airports, airbase, Port and harbour, defence establishments, special economic zones, State and Central government organizations, places of pilgrims, religious & historical importance.

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- **Every waste generator shall**
  - **segregate and store the waste generated by them in three separate streams namely bio-degradable, non biodegradable and domestic hazardous wastes** in suitable bins and handover segregated wastes to authorised waste pickers or waste collectors as per the direction or notification by the local authorities from time to time. **Hence statement 1 is not correct.**
  - store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016.
- All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.
- **All manufacturers of disposable products such as tin, glass, plastics packaging, etc., or brand owners who introduce such products in the market shall provide necessary financial assistance to local authorities for establishment of waste management system. Hence statement 2 is correct.**
  - All such brand owners who sell or market their products in such packaging material which are nonbiodegradable shall put in place a system to collect back the packaging waste generated due to their production.
- All hotels and restaurants should segregate biodegradable waste and set up a system of collection or follow the system of collection set up by local body to ensure that such food waste is utilized for composting /bio-methanation.
- The bio-degradable waste should be processed, treated and disposed of through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local authority.
- The developers of Special Economic Zone, industrial estate, industrial park to earmark at least 5% of the total area of the plot or minimum 5 plots/ sheds for recovery and recycling facility.
- **Non recyclable waste having calorific value of 1500 K/cal/kg or more shall not be disposed of on landfills and shall only be utilised for generating energy either or through refuse derived fuel or by giving away as feed stock for preparing refuse derived fuel. Hence statement 3 is correct.**
  - High calorific wastes shall be used for co-processing in cement or thermal power plants.
  - The local body or an operator of facility or an agency designated by them proposing to set up waste to energy plant of more than five tones per day processing capacity shall submit an application to the State Pollution Control Board or Pollution Control Committee, as the case may be, for authorisation.

**Q 60.A**

- The treatment of waste water involves six steps: **Sedimentation, Coagulation, Filtration, Disinfection, Softening and Aeration.**
- If waste water is to be disposed off into a river, stream or any other receiving water body, it is treated only upto the first four steps, i.e, **sedimentation, coagulation, filtration and disinfection**. This is known as **primary treatment.**
- If, however, the recovered water is to be used for drinking purpose, it has to undergo further treatment, i.e., **softening and aeration**, these two are collectively known as **secondary treatment.**
- **Sedimentation** occurs naturally in reservoirs and is accomplished in treatment plants by storing sewage or wastewater in basins or settling tanks. **Silt, clay and other fine materials** settle to the bottom if water is allowed to stand or flow quietly at low velocity. **Hence, pair 2 is correctly matched.**
- Fine particles and colloidal materials are combined into conglomerates by Coagulation. Coagulation is brought about by using special chemicals known as coagulants/flocculants, such as potash alum. This step is also known as flocculation.
- Suspended solids, colloidal material, bacteria and other organisms are **filtered out by passing the wastewater through a bed of sand** or finely graded coal or through a matrix of fibrous material supported on a perforated core.
- After **filtration the water undergoes disinfection**. There are several methods of treatment of water to kill living organisms, particularly pathogenic bacteria. The application of chlorine or its compounds such as bleaching powder is commonly used for disinfection. **Hence, pair 3 is not correctly matched.**
- Softening is a process of treatment of water by which undesirable cations of calcium and magnesium are removed from hard waters. Aeration is a process of exposing water to air by forcing air through water in the form of bubbles to add oxygen and reduce carbon dioxide, hydrogen sulphide, and taste-producing gases or vapours. **Hence, pair 1 is not correctly matched.**

**Q 61.D**

- According to the US Department of Energy, **coal gasification is a thermo-chemical procedure wherein the pressure and heat of the gasifier disintegrate coal into synthesis gas (syngas)**. The resulting "syngas" is mostly carbon monoxide (CO) and hydrogen, with some other gaseous substances. **Hence statement 1 is correct.**
- Coal gasification is an in-situ method wherein oxygen is infused into the seam together with water and ignited at high temperatures, causing coal to partly oxidised into hydrogen, CO, carbon dioxide (CO2), methane (CH4), and hydrogen sulphide (H2S). **Coal gasification is regarded as a cleaner coal technology when compared to coal combustion. Hence statement 2 is correct.**
- Syngas can be used to generate power, in energy-efficient fuel cell technology, or as chemical "building components" for industrial applications. The hydrogen can also be extracted and used to power a hydrogen economy.
- **Coal gasification is said to be more efficient than traditional coal burning.** A coal gasification processing facility using this dual method can possibly attain an efficiency of 50% or higher, compared to the customary coal power plant, which is typically just above 30%.
- **The syngas produced by coal gasification can be used to generate urea** and a variety of products such as methanol, Dimethyl ether (DME), and olefins, allowing India to minimise imports and become self-sufficient. **Hence statement 3 is correct.**

**Q 62.C**

- Launched in 2015, the Global Wildlife Program (GWP), a "Global Partnership on Wildlife Conservation and CrimePrevention for Sustainable Development" is a $131 million grant program **funded by the Global Environment Facility (GEF) and led by the World Bank Group. Hence statement 2 is correct.**
  - The GWP seeks to address the illegal wildlife trade (IWT) across 30 countries in Asia, Africa, and Latin America by serving as a platform for knowledge exchange and coordination, and supporting on-the-ground actions.
- **The GWP is one of the largest global partnerships created to combat wildlife poaching, trafficking, and demand.** In 2019, the GWP expanded its focus to include the promotion of wildlife-based economies to create economic benefits from conserving wildlife and habitats. **Hence statement 1 is correct.**
- The GWP addresses issues such as illegal wildlife trade (IWT), human-wildlife conflict (HWC), and lack of sustainable livelihood opportunities for local communities. The program enables cooperation and knowledge sharing across national and local governments and partners to create a long-lasting impact.
- Collectively, GWP projects are aiming to achieve the following conservation impacts through on-the-ground activities:
  - Supporting the improved management of 59 million hectares of land, including improved management effectiveness of over 135 protected areas.
  - Preventing the emission of 58 million tons of CO2 equivalent.
  - Positively impacting local communities and stakeholders, with 1.9 million expected beneficiaries.
- Knowledge sharing and management is a core components of the GWP. Projects share lessons learned, generate best practices, and exchange information in support of conservation and development.

**Q 63.A**

- The ozone hole first appeared over Antarctica because atmospheric and chemical conditions unique to this region increase the effectiveness of ozone destruction by reactive halogen gases. In addition to an abundance of these reactive gases, the formation of the Antarctic ozone hole requires temperatures low enough to form polar stratospheric clouds (PSCs), isolation from air in other stratospheric regions, and sunlight.
- There is a correlation that exists between the cycle of ozone depletion and the presence of polar stratospheric clouds (PSCs) i.e. the ice particles of the cloud provided substrates for chemical reactions that free chlorine from its reservoirs. **The molecular chlorine can be broken down to atomic chlorine and the ozone depletion reaction would continue.**
- The severe ozone destruction represented by the ozone hole requires that low temperatures be present over a range of stratospheric altitudes, over large geographical regions, and for extended time periods. **Low temperatures are important because they allow liquid and solid PSCs to form.**
- The longevity of the vortex is another factor, enhancing favourable conditions for the depletion of ozone. The vortex isolates stratospheric air in the polar regions from other stratospheric regions for long periods in the winter months. Once chemical changes occur in polar regions from reactions on PSCs, the isolation preserves those changes for many weeks to months. **Splitting of the polar vortex would create a pathway for ozone-rich air to rush back into the polar region leading to the formation of the ozone layer.**
- **Hence option (a) is the correct answer.**

**Q 64.C**

- The Delhi High Court recently passed an interim order to prevent the unlawful use of Bollywood star Amitabh Bachchan's name, image and voice. The court, through its order, restrained persons at large from infringing the personality rights of the actor.
- **Personality rights refer to the right of a person to protect his/her personality under the right to privacy or property**. These rights are important to celebrities as their names, photographs or even voices can easily be misused in various advertisements by different companies to boost their sales. Therefore, it is necessary for renowned personalities/celebrities to register their names to save their personality rights. **Hence statement 1 is correct.**
    - A large list of unique personal attributes contribute to the making of a celebrity. All of these attributes need to be protected, such as name, nickname, stage name, picture, likeness, image and any identifiable personal property, such as a distinctive race car.
    - Personality rights are different from publicity rights. Personality rights consist of two types of rights, firstly, the right of publicity, or the right to keep one's image and likeness from being commercially exploited without permission or contractual compensation, which is similar (but not identical) to the use of a trademark; and secondly, the right to privacy or the right to not have one's personality represented publicly without permission.
- However, under common law jurisdictions, publicity rights fall into the realm of the 'tort of passing off'. Passing off takes place when someone intentionally or unintentionally passes off their goods or services as those belonging to another party. Often, this type of misrepresentation damages the goodwill of a person or business, resulting in financial or reputational damage.
    - **Publicity rights are governed by statutes like the Trade marks Act 1999 and the Copyright Act 1957. Hence statement 2 is correct.**

**Q 65.C**

- In 1997, **the Kyoto protocol identified SF6 as one of the six main greenhouse gases (GHG).** SF6 is the most potent GHG known to humanity, with a **warming potential 23,900 times that of carbon dioxide (CO2)** and atmospheric residence of up to 3,200 years. Its high atmospheric stability and ability to trap infrared radiation means it's far more potent at warming the earth's atmosphere than CO2 over longer periods of time.

| S.N. | Greenhouse Gas | Lifetime in the atmosphere (Years) | Warming Potential over 100 years (Compared to CO2) |
|---|---|---|---|
| 1 | Carbon dioxide | 50-200 | 1 |
| 2 | Methane | 12 | 23 |
| 3 | Nitrous Oxide | 120 | 296 |
| 4 | **Chlorofluorocarbons** | **550** | **7000** |
| 5 | Hydrofluorocarbons | 3.7-264 | 40-11700 |
| 6 | Perfluorocarbons | 3200-50000 | 6500-9200 |
| 7 | **Sulphur hexafluoride** | **3200** | **23900** |

- **Hence, statement 2 is correct.**
- Sulphur hexafluoride (SF6) is primarily of anthropogenic origin but also occurs naturally. Significant concentrations of naturally occurring SF6 were found in some igneous, volcanic, and sedimentary rocks and in some hydrothermal fluids.
- **The electrical equipment's and magnesium smelting sectors are the main sources of SF6 emissions.** The natural source of SF6 is almost negligible as compared to anthropogenic sources. The SF6 contributes about 0.1% of the total anthropogenic radioactive forcing and its concentration continuously increasing in the atmosphere. **Hence statement 1 is correct.**
- Unique chemical properties of SF6 make it a great electrical insulator. It is highly stable, non-toxic, non-flammable, electronegative, and has excellent arc-quenching properties. SF6 is used in gas-insulated switchgear for wind turbines to prevent overloading and short-circuiting.

**Q 66.D**

- Established in 1994, the United Nations Convention to Combat Desertification (UNCCD) addresses specifically the arid, semi-arid and dry sub-humid areas, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found.
- The UNCCD is one of the three Rio Conventions—along with the UN Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD)—and was called for in Agenda 21,

the programme of action adopted at the 1992 UN Conference on Environment and Development (UNCED, or Earth Summit).

- **The UNCCD is the only legally binding framework set up to address desertification and the effects of drought.** There are 197 Parties to the Convention, including 196 country Parties and the European Union. The Convention – based on the principles of participation, partnership and decentralization – is a multilateral commitment to mitigate the impact of land degradation, and protect our land so we can provide food, water, shelter and economic opportunity to all people.
- **The UNCCD is particularly committed to a bottom-up approach, encouraging the participation of local people in combating desertification and land degradation.** The UNCCD secretariat facilitates cooperation between developed and developing countries, particularly around knowledge and technology transfer for sustainable land management. **Hence statement 1 is correct.**
- The Convention unites governments, scientists, policymakers, the private sector and communities around a shared vision to restore and manage the world's land. This work is crucial to ensure the sustainability of the planet and the prosperity of future generations.
- **Initiatives launched under the UNCCD to combat land desertification and degradation:**
    - **Land Degradation Neutrality (LDN) Target Setting Programme:** UNCCD in collaboration with multiple international partners, are supporting interested countries with their national LDN target setting process. To date, over 120 countries, including India, have committed to setting LDN targets.
    - **Land Degradation Neutrality Fund (LDN Fund):** Officially launched at UNCCD COP 13 in Ordos, China, it is the first-of-its-kind investment vehicle leveraging public money to raise private capital for sustainable land projects. **Hence statement 2 is correct.**
    - **Global Land Outlook (GLO)** is a strategic communications platform and **associated publications of the UNCCD secretariat** that demonstrates the central importance of land quality to human well-being. **Hence statement 3 is correct.**
    - **Land for Life Programme** was launched at the tenth UNCCD Conference of the Parties (COP10) in 2011 as part of the Changwon Initiative. The Programme seeks to address the challenges of land degradation, desertification and mitigation of drought.

**Q 67.B**

- **Biomass is a renewable energy resource** derived from the carbonaceous waste of various human and natural activities. It is derived from numerous sources, including the by-products from the timber industry, agricultural crops, grassy and woody plants, residues from agriculture or forestry, oil-rich algae, and the organic component of municipal and industrial wastes. Biomass is a good substitute for conventional fossil fuels for heating and energy generation purposes. **Hence statement 1 is not correct.**
- **Burning biomass releases about the same amount of carbon dioxide as burning fossil fuels.** However, fossil fuels release carbon dioxide captured by photosynthesis over its formative years. Biomass, on the other hand, releases carbon dioxide that is largely balanced by the carbon dioxide captured in its own growth (depending on how much energy was used to grow, harvest, and process the fuel).
- Burning biomass releases carbon monoxide, carbon dioxide, nitrogen oxides, and other pollutants and particulates. If these pollutants are not captured and recycled, burning biomass can create smog. **Hence statement 2 is correct.**
- Chemical processes like gasification, combustion and pyrolysis convert biomass to useful products, combustion being the most common of them. Each of the technologies mentioned produces a major calorific end product and a mixture of by-products.

**Q 68.C**

- **'Fugitive emissions'** are **unintended emissions from facilities or activities** (e.g., construction) that "could not reasonably pass through a stack, chimney, vent, or another functionally equivalent opening." **Examples of fugitive releases include losses from pipework or wind-blown dust from stockpiles**.
- Occasionally these emissions can be significant at a local level. **Street dust from paved and unpaved roads**, building construction and demolition activities, dust generated from loading and unloading of goods, spraying and ploughing in agriculture, leaf burning, cigarette smoking, material handling and storage, and leakages are all possible sources of fugitive emissions.
- **These emissions are all non-point in nature**. The main concern with fugitive emissions is it is very difficult to quantify, and regulations are poor.
- **Hence, option (c) is the correct answer.**

**Q 69.D**

- Windrow composting is the most common process of composting in India. **It mainly involves the stabilization of organic solid waste through aerobic decomposition.**
- **Windrow composting process facilities can efficiently handle large quantities of waste in comparison to vermicomposting. It is a process for biodegrading organic material aerobically.**
- **Hence statements 1 and 2 are not correct.**
- The method produces heat that destroys pathogens and also produces a stabilized compost product for use as mulch, soil conditioner, and topsoil additive.
- Then, the organic material is left to decompose outdoors, aided only by watering and mechanical turning for aeration. This process is simple, non-intensive, has a very low capital cost, and is used by farmers, municipalities, and waste processing corporations. It is the slowest large-scale process used to produce compost. Windrow composting process can be used to process yard waste, food, paper, and sewage sludge.
- This type of composting involves forming organic waste into rows of long piles called "windrows" and aerating them periodically by either manually or mechanically turning the piles.
    - Large volumes of diverse wastes such as yard trimmings, grease, liquids, and animal byproducts (such as fish and poultry wastes) can be composted through this method.

**Q 70.D**

- **The Convention on Nuclear Safety (CNS) aims to commit Contracting Parties operating land-based civil nuclear power plants** to maintain a high level of safety by establishing fundamental safety principles to which States would subscribe. **Hence statement 1 is not correct.**
- The Convention is based on the Parties' common interest to achieve higher levels of safety that will be developed and promoted through regular meetings. It obliges Parties to submit reports on the implementation of their obligations for "peer review" at meetings that are normally held at International Atomic Energy Agency (IAEA) Headquarters. This mechanism is the main innovative and dynamic element of the Convention.
- **The Convention on Nuclear Safety was adopted on 17 June 1994 by a Diplomatic Conference convened by the International Atomic Energy Agency at its Headquarters. Thus it is a treaty spearheaded by IAEA. Hence statement 2 is not correct.**
- India has signed and ratified this treaty.

**Q 71.A**

- **The Reserve Bank of India recently announced the launch of retail digital rupee (eRs-R) on 1 December on a pilot basis**. According to a statement from RBI, the pilot would cover select locations in closed user group (CUG) comprising participating customers and merchants.
- The Digital Rupee would be in the form of a digital token that represents legal tender. **Hence statement 1 is correct.**
- The Digital Rupee would be issued in the same denominations that paper currency and coins are currently issued. **Hence statement 2 is not correct.**
- **It would be distributed through intermediaries, banks. Hence statement 3 is not correct.**
- Eight banks have been identified for phase-wise participation in this pilot, according to the central bank.
    - The first phase will begin with four banks, namely State Bank of India, ICICI Bank, Yes Bank and IDFC First Bank in four cities across the country.
    - Four more banks, namely Bank of Baroda, Union Bank of India, HDFC Bank and Kotak Mahindra Bank will join this pilot subsequently.
- The pilot would initially cover four cities, namely, Mumbai, New Delhi, Bengaluru and Bhubaneswar. It will later extend to Ahmedabad, Gangtok, Guwahati, Hyderabad, Indore, Kochi, Lucknow, Patna and Shimla.
- Users will be able to transact with eRs-R through a digital wallet offered by the participating banks and stored on mobile phones/devices.
- Transactions can be both person-to-person (P2P) and person-to-merchant (P2M). Payments to merchants can be made using quick response (QR) codes displayed at merchant locations, according to the statement.

**Q 72.A**

- **In October of 2016, during the 28th Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer in Kigali (Rwanda), more than 170 countries agreed to amend the Protocol. Hence, statement 1 is correct.**
- The Kigali Amendment aims for the phase-down of hydrofluorocarbons (HFCs) by cutting their production and consumption. **Given their zero impact on the depletion of the ozone layer, HFCs are currently**

**used as replacements for hydrochlorofluorocarbons (HCFCs) and chlorofluorocarbons (CFCs), however, they are powerful greenhouse gases. With the Kigali Amendment, the Montreal Protocol will be an even more powerful instrument against global warming.**

- India will complete its phase-down of HFCs in 4 steps from 2032 onwards with a cumulative reduction of 10% in 2032, 20% in 2037, 30% in 2042 and **85% in 2047. Hence, statement 2 is not correct.**

**Q 73.D**

- There are two ways in which energy can be harnessed:
  - Onshore wind energy, is the power that's generated by wind turbines located on land driven by the natural movement of the air.
  - Offshore wind energy, on the other hand, is the energy generated from farms that are located over shallow open water, usually in the ocean, where there are higher wind speeds
- According to the Ministry of New & Renewable Energy (MNRE), India can generate 127 GW of offshore wind energy with its 7,600 km of coastline. **The government has set a target of 5.0 GW of offshore wind installation by 2022 and 30 GW by 2030. Hence statement 1 is correct.**
  - Ministry of New and Renewable Energy (MNRE) has issued a draft tender to lease seabed areas off Tamil Nadu for 4 GW equivalent offshore wind project capacity during the Fiscal Year 2022-23. Until 2025, India will be leasing out offshore wind energy blocks equivalent to 4 GW capacity and will raise this to 5 GW in the following five rounds.
- Government of India notified National Offshore Wind Energy Policy-2015 for the development of offshore wind power in the country. The policy provides for offshore wind power development up to a seaward distance of 200 nautical miles from the baseline, i.e., up to the country's Exclusive Economic Zone (EEZ). **Hence statement 2 is not correct.**
- Ministry of New & Renewable Energy (MNRE) is the Nodal Ministry, and the **National Institute of Wind Energy (NIWE) is the Nodal Agency** for the development of Offshore Wind Energy in India. **Hence statement 3 is correct.**

**Q 74.B**

- **Biochar is defined as a carbon-rich material produced during the pyrolysis process (not incineration)** that is a thermochemical decomposition of biomass with a temperature of about ≤700°C in the absence or limited supply of oxygen. **Hence statement 1 is not correct.**
  - Both incineration and pyrolysis are forms of combustion in which the thermal decomposition of matter takes place. The key difference between incineration and pyrolysis is that incineration is the combustion of organic matter in the presence of oxygen whereas pyrolysis is the combustion of organic matter in the absence of oxygen.
- Biochar is primarily carbon (~85%), but it can also contain oxygen, hydrogen, and inorganic ash if present in the parent biomass. The heating value of biochar is in the range 25–32 MJ/kg dry basis, which is substantially higher than that of the parent biomass or its liquid product. As biomass is carbon neutral, the combustion of biochar is considered more environmentally friendly than coal.
- Biochar is characterized by a large pore surface area. Hence it has a large number of nonfuel use such as the adsorption of chemicals and carbon storage in the ground. When added back to the soil, biochar absorbs and retains water and nutrients. **Biochar enriches the soil and prevents it from leaching pesticides and other nutrients into the runoff. Hence statement 2 is correct.**
- **Biochar is also an excellent carbon sink.** When biomass is charred, it sequesters, or stores, its carbon content. When biochar is added back to the soil, it can continue to absorb carbon and form large underground stores of sequestered carbon that can lead to negative carbon emissions and healthier soil. **Hence statement 3 is correct.**

**Q 75.B**

- **Representatives from 196 countries, including India, have gathered at the 15th Conference of Parties (COP15) at the Convention of Biological Diversity (CBD) in Montreal, Canada**.
- Over 20,000 delegates from around the world are participating in the talks, with the goal of establishing an eight-year plan to protect and restore biodiversity. This includes preserving 30% of the planet's land and water, as well as fairly sharing the benefits of genetic resources. This has popularized the slogan **"30 by 30"** among the conference attendees.
- The post-2020 **Global Biodiversity Framework (GBF)** contains 22 action-oriented targets and four goals proposed for 2030, including the **30 by 30 goal, which aims to protect 30% of the world's land and oceans by 2030.**

- Challenges that need to be addressed during the negotiations include the finance gap, safeguarding indigenous rights, access and benefit-sharing from digital sequence information, and implementation and monitoring of goals. To help progress the refined draft text of the GBF, the Youth Summit and the Open-Ended Working Group have been convened to include the perspectives of indigenous rights activists, the business and finance sector, and the Global South. The GBF would be the first global framework on biodiversity since the Aichi Biodiversity Targets were agreed upon in 2010.
- India, a signatory to CBD, supports the 30 by 30 (30X30) goal by seeking to integrate other effective area-based conservation measures (OECMs) into the wider landscapes and seascapes. The country is part of the High Ambition Coalition (HAC) for Nature and People, a group of more than 70 countries encouraging the adoption of the global goal to protect 30% of land and seascapes by 2030, but details on safeguarding rights of indigenous communities are yet to be hammered out.
- **Hence option (b) is the correct answer.**

**Q 76.A**

- The Intergovernmental Panel on Climate Change (IPCC) is an **intergovernmental body of the United Nations responsible for advancing knowledge on human-induced climate change.**
- It was established in **1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), and later endorsed by United Nations General Assembly. Hence, statement 1 is correct.**
- It is headquartered in Geneva, Switzerland, and is composed of 195 member states.
- The IPCC is governed by its **member states, which elect a bureau of scientists to serve for the duration of an assessment cycle (usually six to seven years);** the bureau selects experts nominated by governments and observer organisations to prepare IPCC reports.
- The IPCC is supported by a secretariat and various "Technical Support Units" from specialised working groups and task forces.
- The IPCC provides objective and comprehensive scientific information on anthropogenic climate change, including the natural, political, and economic impacts and risks, and possible response options.
- **It does not conduct original research nor monitor climate change, but rather undertakes a periodic, systematic review of all relevant published literature. Thousands of scientists and other experts volunteer to review the data and compile key findings into "Assessment Reports" for policymakers and the general public. Hence, statement 3 is not correct.**
- this has been described as the biggest peer review process in the scientific community.
- The IPCC's Assessment Reports (ARs), which are produced every few years, are the most comprehensive and widely accepted scientific evaluations of the state of the Earth's climate. **Hence, statement 2 is not correct.**
- In 2015, the IPCC began its sixth assessment cycle, to be completed in 2022. In August 2021, the Physical Science working group of the IPCC published its contribution the **Sixth Assessment Report (IPCC AR6).**

**Q 77.B**

- **The Bamako Convention is a treaty of African nations prohibiting the import into Africa of any hazardous (including radioactive) waste. The convention came into force in 1998.**
- The Bamako convention is a response to Article 11 of the Basel convention which encourages parties to enter into bilateral, multilateral and regional agreements on Hazardous Waste to help achieve the objectives of the convention.
- Purpose of the Convention
  - To prohibit the import of all hazardous and radioactive wastes into the African continent for any reason
  - To minimize and control transboundary movements of hazardous wastes within the African continent.
  - To prohibit all ocean and inland water dumping or incineration of hazardous wastes.
  - To ensure that disposal of wastes is conducted in an "environmentally sound manner"
  - To promote cleaner production over the pursuit of a permissible emissions approach based on assimilative capacity assumptions
  - To establish the precautionary principle.
- To date, it has 29 Signatories and 25 Parties.
- **Hence option (b) is the correct answer.**

**Q 78.B**

- **The UN Environment Programme (UNEP) has launched a Green Economy Initiative, which seeks to respond to the global economic downturn by focusing on economic growth and job creation in environmental industries.**

- **The initiative launched in 2008, in London, UK, is funded by the European Commission, Germany and Norway. It builds on the G8+5 study on the Economics of Ecosystems and Biodiversity(TEEB), which emphasized the economic implications of ecosystem degradation and biodiversity loss, as well as their link to poverty.**
- The US$4 million Green Economy Initiative will look to clean and rural energy and technologies, sustainable agriculture, ecosystem infrastructure, reduced emissions from deforestation and forest degradation, and sustainable cities to promote its priorities, which include valuing and mainstreaming nature's services, generating employment through green jobs and policy, and accelerating the transition to a green economy via instruments and market signals.
- Within UN Environment, the green economy initiative produces a **Green Economy Report** and related research materials, which will analyze the macroeconomic, sustainability, and poverty reduction implications of green investment in a range of sectors from renewable energy to sustainable agriculture and provide guidance on policies that can catalyze increased investment in these sectors.
- Under the initiative UNEP also Provides advisory services on ways to move towards a green economy in specific countries and engaged in a wide range of research, non-governmental organizations, business, and UN partners in implementing the Green Economy Initiative. **Hence option (b) is the correct answer.**

**Q 79.B**

- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted in 1989 and it came into force in 1992. It is the most comprehensive global environmental agreement on hazardous wastes and other wastes.
- The Basel Convention regulates the transboundary movements of hazardous wastes and other wastes and obliges its parties to ensure that such wastes are managed and disposed of in an environmentally sound manner. The Convention covers toxic, poisonous, explosive, corrosive, flammable, ecotoxic and infectious wastes.
- Thus it covers wastes such as
  - **Clinical wastes** from medical care in hospitals
  - Wastes from the production, formulation and use of organic solvents
  - Wastes from production, formulation and use of resins, latex, plasticizers
  - Wastes resulting from surface treatment of metals and **plastics**
  - Residues arising from industrial waste disposal operations etc
- **Despite this, it does not, however, address the movement of radioactive waste.** Radioactive waste is subject to other international control systems, including international instruments, applying specifically to radioactive materials, are excluded from the scope of this Convention.
- **Wastes which derive from the normal operations of a ship,** the discharge of which is covered by another international instrument, **are excluded from the scope of this Convention.**
- **Hence option (b) is the correct answer.**

**Q 80.C**

- The United Nations Conference on Environment and Development (UNCED), also known as the **Rio de Janeiro Earth Summit, Rio Summit, Rio Conference, and Earth Summit.** It was attended by 170 states, thousands of NGOs and many multinational corporations. It succeeded in raising public awareness of the **need to integrate environment and development.**
- This summit led to the development of the following documents:
  - **Rio Declarations was the output of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. Rio Declaration on Environment and Development** contained 27 principles that were supposed to guide countries in future sustainable development. As a diplomatic conference declaration, **Rio declaration is formally not binding. Hence statement 1 is not correct.**
  - **Agenda 21** is an action plan concerning sustainable development, but it is non-binding. One major objective of the Agenda 21 initiative is that every local government should draw its own local Agenda 21. Its aim initially was to achieve global sustainable development by 2000, **with the "21" in Agenda 21 referring to the original target of the 21st century. Hence, statement 2 is not correct.**
  - **Forest Principles** is formally called 'Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests'. It makes many recommendations for conservation and sustainable development forestry and is non-binding.

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- **Important legally binding agreements were opened for signature:**
  - **Convention on Biological Diversity:**
    - ✓ The Convention has three main goals: the conservation of biological diversity (or biodiversity); the sustainable use of its components; and the fair and equitable sharing of benefits arising from genetic resources. Its objective is to develop national strategies for the conservation and sustainable use of biological diversity, and it is often seen as the key document regarding sustainable development. **Hence statement 3 is correct.**
  - **United Nations Convention to Combat Desertification:**
    - ✓ The United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD) is a Convention to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements.

**Q 81.A**

- **The Central Pollution Control Board (CPCB) of India is a statutory organization under the Ministry of Environment, Forest, and Climate Change. It was established in 1974 under the Water (Prevention and Control of Pollution) Act, 1974. Hence option (a) is the correct answer.**
- The CPCB is also entrusted with the powers and functions under the Air (Prevention and Control of Pollution) Act, 1981. It serves as a field formation and also provides technical services to the Ministry of Environment and Forests under the provisions of the Environment (Protection) Act, 1986.
- **It coordinates the activities of the State Pollution Control Boards (SPCBs) by providing technical assistance and guidance and also resolves disputes among them. It is the apex organization in the country in the field of pollution control, as a technical wing of MoEFCC.**
- CPCB aims to promote the cleanliness of streams and wells in different areas of the states by preventing, controlling, and abatement of water pollution, and to improve the quality of air and preventing, controlling, and abating air pollution in the country.
- **CPCB runs nationwide programs of ambient air quality monitoring known as the National Air Quality Monitoring Programme. The network consists of 621 operating stations covering 262 cities/towns in 29 states and 5 Union Territories of the country.**
- CPCB in collaboration with concerned SPCBs established a nationwide network of water quality monitoring, which has running 1019 stations in 27 States and 6 Union Territories. The monitoring process is done on a quarterly basis in surface waters and on half yearly basis in case of groundwater.

**Q 82.B**

- A team of researchers from the University of Alberta has discovered at least t**wo new minerals that have never been seen on Earth before in a meteorite found in Somalia.**
- At 15 tonnes, the meteorite is the ninth-largest meteorite ever found.
- The two newly discovered minerals have been named **elaliite and elkinstantonite**. The first receives its name from the meteorite itself, dubbed the "El Ali" meteorite because it was found near the town of El Ali, in the Hiiraan region of Somalia.
- **Hence option (b) is the correct answer.**

**Q 83.D**

- Noise Pollution (Regulation and Control) Rules, 2000, are **framed under the provisions of the Environment (Protection) Act, 1986.** The Environment (Protection) Act, of 1986 empowers the Central Government to frame rules for the prevention and control of noise pollution. Thus the penalties for violation of the rules are imposed as per the provisions of the Environment (Protection) Act, of 1986.
- The **rules provide norms for controlling noise pollution in the following ways:**
  - The noise level at the boundary of the public place, where loudspeaker or public address system or any other noise source is being used shall not exceed 10 dB (A) above the ambient noise standards for the area or 75 dB (A) whichever is lower.
  - The peripheral noise level of a privately owned sound system or a sound producing instrument shall not, at the boundary of the private place, exceed by more than 5 dB (A) the ambient noise standards specified for the area in which it is used.
  - **No horn shall be used in silence zones or during night time in residential areas except during a public emergency.**
  - Sound emitting fire crackers shall not be burst in silence zone or during night time.
  - Sound emitting construction equipments **shall not be used or operated during night time in residential areas** and silence zones. **Hence, statement 2 is correct.**

- The **rules empower the State Government to categorise the area into industrial, commercial residential or silent areas/zones for the purpose of implementing noise, standards for different areas. Hence statement 1 is correct.**
- **An area comprising not less than 100 metres around hospitals, educational institutions and courts may be declared as silence area / zone for the purpose of these rules. Hence statement 3 is correct.**
- **The State Government** shall take measures for abatement of noise including the noise emanating from vehicular movements, [blowing of horns, bursting of sound emitting firecrackers, use of loudspeakers or public address system and sound producing instruments] and ensure that the existing noise levels do not exceed the ambient air quality standards specified under these rules.

**Q 84.C**

- **Researchers at IIT Madras have developed and deployed a system that could generate electricity using energy from seawaves.**
- The system, dubbed **Sindhuja-I,** was deployed by the researchers about six kilometres from the coast of Tuticorin in Tamil Nadu, where the sea has a depth of about 20 metres. Sindhuja-I can currently produce 100 watts of energy. It will be scaled up to produce one megawatt of energy in the next three years.
- The Sindhuja-I system consists of a floating buoy, a spar and an electrical module. The buoy moves up and down as the waves oscillate up and down. There is a hole at the centre of this buoy that will allow the spar to pass through it. The spar is fixed to the seafloor to ensure that the waves don't move it. But when the buoy moves and the spar doesn't, the waves produce a relative motion between both. This relative motion is used by an **electric generator to produce power.**
- **Hence option (c) is the correct answer.**

**Q 85.B**

- **Oilzapper and Oilivorous-S are the bioremediation techniques** used for the degradation of oil sludge.
- **Oilzapper** is a bacterial consortium developed by **TERI** that degrades crude oil and oily sludge. Oilzapper is essentially a cocktail of five different bacterial strains that are immobilized and mixed with a carrier material. **Oilivorous-S was jointly developed** by TERI's microbial **biotechnology laboratory** and the **R&D Centre of the IOCL, New Delhi**. It is marketed by both organizations.
- Among all the other advantages these technologies offer, two crucial ones stand out.
- First, **both Oilzapper and Oilivorous-S can be used in situ,** thereby eliminating the need to transfer large quantities of contaminated waste from the site, a process that poses more threats to the environment. Secondly, the solution is complete in itself contaminants are not merely transferred from one environmental medium to another (from water to air or land) but destroyed. **Hence, statement 1 is not correct.**
- The Oilzapper feeds on hydrocarbon compounds present in crude oil and oily sludge (a hazardous hydrocarbon waste generated by oil refineries) and converts them into harmless CO2 and water. The Oilzapper is neatly packed into sterile polythene bags and sealed aseptically for safe transport. The shelf life of the product is three months at ambient temperature.
- Depending upon the compositional characteristics and source/ type of sludges to be treated, the variants of the microbial mix are designated as **'OiliVorous-S' for tank bottom sludge and 'OiliVorous- A' for acidic sludge.**
- **The major attributes of the product are**:
  - It contains "Natural Isolates", Safer to handle, no disease-causing organisms,
  - It has excellent capability to degrade a wide range of hydrocarbon contaminants
  - including organosulfur compounds.
- What makes **Oilivorous-S different from Oilzapper** is an additional bacterial strain that makes the former **more effective against sludge and crude oil with high-sulphur content. Hence, statement 2 is correct.**

**Q 86.C**

- Rhizofiltration, a hydroponic-based green technology, implements the use of aquatic and land plants for water treatment by absorbing, concentrating, precipitating heavy metals from wastewater. Heavy metals such as lead, cadmium, cobalt, copper, uranium, arsenic are too low for efficient removal through conventional methods but can be efficiently removed through this technique.
- The method is cost-effective and sustainable as **it involves the use of plant roots to absorb and concentrate heavy metals from polluted aqueous streams. It is a plant-based technique where hydroponically grown plants' roots act as filters** to remove the metal contaminants by absorbing and precipitating the chemicals from aquatic environments. **Hence option (c) is the correct answer.**

- Root surface provides efficient area for the absorption of the metals or contaminants (copper, lead, cadmium, zinc, chromium, nickel) into the root tissues. Both aquatic and terrestrial plants are used for rhizofiltration.
- A few examples of aquatic **plants usually engaged in rhizofiltration are water hyacinth**, duckweed , whereas terrestrial plants are **tobacco sunflower**, spinach, rye and Indian mustard. Terrestrial plants are widely preferred for rhizofiltration as they have long, fibrous root system with fast growth and increased surface area.

**Q 87.A**

- Ozone is a gas composed of three atoms of oxygen. Ozone occurs both in the Earth's upper atmosphere and at ground level. Ozone can be good or bad, depending on where it is found.
- Called **stratospheric ozone, good ozone occurs naturally in the upper atmosphere, where it forms a protective layer that shields us from the sun's harmful ultraviolet rays.**
- Tropospheric, or ground level ozone, is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight.
- **The ozone found in the troposphere is near the earth's surface and is harmful to life (causes breathing issues in humans) and plants (damages crops and plants.) Urban smog comprises the bad ozone. At lower levels, it is an important greenhouse gas and air pollutant, which is harmful to human and ecosystem health. It is also a major component of urban smog. Hence, statement 1 is correct.**
- The ozone layer acts as an invisible shield and protects us from harmful ultraviolet (UV) radiation from the sun. In particular, the ozone layer protects us from the **UV radiation, known as UV-B, which causes sunburn.** Long-term exposure to high levels of UV-B threatens human health and damages most animals, plants and microbes, so the ozone layer protects all life on Earth. By absorbing UV-B in the stratosphere, the ozone layer prevents harmful levels of this radiation from reaching Earth's surface. **Hence, statement 2 is correct.**
- **UV-C, which is very harmful to all living things, is entirely screened out** by a combination of dioxygen (< 200 nm) and ozone (> about 200 nm) by around 35 kilometres (115,000 ft) altitude.
- **Appearance of hole over Antarctica is an annual phenomenon** that takes place from September to early December when the westerly winds circulate all over the continent. **The frigid temperature during this time, in combination with the Chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs)** contained in the manufactured chemicals that are emitted from the surface of the Earth, trigger ozone depletion. High altitude clouds are formed as the temperature goes down. Chlorine and bromine react within these clouds in a photochemical process and destroy the surrounding ozone layer. The following entry of ultraviolet rays increases the chances of skin cancer and blindness in humans and sun damage in animals.
- **The formation of ozone hole in the Arctic is a rare event given the fact that it usually doesn't get cold enough in Arctic stratosphere for an ozone hole to form.** The wintertime temperatures in the Arctic stratosphere are not persistently low for as many weeks as over **Antarctica**, which results in correspondingly less ozone depletion in the Arctic. **Hence, statement 3 is not correct.**

**Q 88.A**

- In a novel diplomatic step, India is moving in to strategically engage with a new geopolitical grouping: the Lusophone (**Portuguese-speaking countries**) as Delhi wants to leverage the untapped potential and the historical connection.
  - The Lusophone world is spread in nine countries across four continents, and Portuguese is the most widely-spoken language in the Southern Hemisphere. Officials feel that from Vasco da Gama onwards, India's Portuguese connection has not been diplomatically leveraged.
- Lusophones are peoples that speak Portuguese as a native or as a common second language and nations where Portuguese features prominently in society.
- Comprising an estimated 270 million people spread across 10 sovereign countries and territories, thus called Lusofonia or the Lusophone world (Portuguese: Mundo Lusófono), is the community of Portuguese-speaking (Lusophone) world; these include **Angola, Brazil, Cape Verde, Galicia, Guinea Bissau, Equatorial Guinea, Macau, Mozambique, Portugal, São Tomé and Príncipe, East Timor, Uruguay, Cochin, Azores, Madeira, Goa, Daman and Diu, Singapore and Malacca** to various degrees.
- Portuguese is one of the official languages of the continental organisations: African Union, Organization of American States, European Union and of multiple regional organisations, as well as official language of

UNESCO General Conference. More than 265-million speakers worldwide; most widely spoken language in the Southern Hemisphere; regarded as the language of the first globalisation in the modern era.

- **Hence option (a) is the correct answer.**

**Q 89.A**

- Scientists urge Andhra Pradesh government to protect glacial-period coastal red sand dunes of Vizag.
- The city of Visakhapatnam in **Andhra Pradesh** is blessed with a number of sites that have geological importance. One among them is the coastal **red sand dunes, popularly known as 'Erra Matti Dibbalu'. Hence option (a) is the correct answer.**
- The site is located along the coast and is about 20 km north-east of Visakhapatnam city and about 4 km south-west of Bheemunipatnam.
- This site was declared as a **geo-heritage site** by the **Geological Survey of India (GSI) in 2014 and the Andhra Pradesh government has listed it under the category of 'protected sites' in 2016. The Erra Matti Dibbalu are spread across an area of about 20 sq km and the entire area has been notified as a Geo Heritage Site.**
- The uniqueness of this site is that the red sediments are a part of the continuation of the evolution of the earth and represent the late quaternary geologic age. With a height of up to 30 m, they exhibit badland topography with different geomorphic landforms and features, including gullies, sand dunes, buried channels, beach ridges, paired terraces, the valley in the valley, wave-cut terrace, knick point and waterfalls.
- It is a lively scientific evolution site, which depicts the real-time effects of climate change. About 18,500 years ago, the sea (Bay of Bengal) was at least 5 km behind from the present coastline. Since then it has been undergoing continuous active changes till about 3,000 years ago and still the changes are on.
- The site also has archaeological significance, as studies of artefacts indicate an Upper Palaeolithic horizon and on cross dating assigned to Late Pleistocene epoch, which is 20,000 BC.

**Q 90.D**

- A hydroelectric power plant consists of a dam built across a large river to create a reservoir and a power station where energy is converted to electricity. Globally, around 2,700 terawatt hour (TWH) of power is generated from hydro sources. The first hydroelectric power project in India was started in Darjeeling in 1898.
- India is endowed with a large hydropower potential of 1,45,320 MW of which only about 45,400 MW has been utilized so far. Only about 10,000 MW of hydropower has been added in the last 10 years. The hydropower sector is currently going through a challenging phase and the share of hydropower in the total capacity has declined from 50.36% in the 1960s to around 13% in 2018-19.
- In terms of installed capacity, **India is the fifth largest producer of hydroelectric power in the world after China, Brazil, US and Canada. Hence statement 1 is not correct.**
- **With a maximum planned capacity of 2,400MW, the biggest hydroelectric power plant in India is in Uttarakhand, namely Tehri Dam. Its construction started in 1978 and was aided by the former USSR.** Located at the confluence of the Bhagirathi and the Bhilangana rivers, near the city of Tehri, the dam is a multi-purpose rock and earth-filled embankment dam, and at 260.5 metres is the tallest in India. With a maximum planned capacity of 2,400MW, the Tehri Hydropower Complex consists of the Tehri Dam and the Tehri Pumped Storage Hydroelectric Power Plant, and also includes the 400MW Koteshwar Dam. **Hence statement 2 is not correct.**
  - **Koyna Hydroelectric Project** with a capacity of 1,960MW is located near Patan, in Maharashtra's Satara district, close to the Koyna River.
  - **Bhakra Hydroelectric Project** is on Satluj river. Installed capacity of Bhakra Right Bank Power House is 785 MW (5x157 MW) and that of Bhakra Left Bank Power House is 612 MW (4x126 MW + 1x108MW).
- The Union Cabinet in 2019 approved a new hydroelectric policy aimed at boosting the sector, including according large hydro projects the status of renewable energy projects. **According to the new policy, large hydro projects will also be designated as renewable energy projects.** Earlier, only smaller projects of less than 25 MW in capacity were categorised as renewable energy. **Hence statement 3 is not correct.**

**Q 91.B**

- **As part of privacy effort, Apple announced that it will now provide full end-to-end encryption.**
- **End-to-end encryption** is a secure line of communication that blocks 3rd party users from accessing transferred data. **Hence option (b) is the correct answer.**
  - It uses an algorithm that transforms standard text into an unreadable format.
  - It is used to secure passwords, protect stored data and safeguard data on cloud storage.

- Its cons involve Law and order overlooked, terrorists and other serious criminals can take advantage of such technologies.

- In symmetric encryption the same key is used for encryption and decryption. It is therefore critical that a secure method is considered to transfer the key between sender and recipient.
- Asymmetric encryption uses the notion of a key pair: a different key is used for the encryption and decryption process. One of the keys is typically known as the private key and the other is known as the public key.
  - The private key is kept secret by the owner and the public key is either shared amongst authorised recipients or made available to the public at large.
  - Data encrypted with the recipient's public key can only be decrypted with the corresponding private key. Data can therefore be transferred without the risk of unauthorised or unlawful access to the data.
- **Phishing i**s a type of social engineering where an attacker sends a fraudulent message designed to trick a person into revealing sensitive information to the attacker or to deploy malicious software on the victim's infrastructure. **Hence option (a) is not correct.**
- **Ransomware** is a type of malicious software that restricts or limits users of a targeted organization from accessing their IT systems (servers, workstations, mobile devices, etc.), until a ransom is paid. **Hence option (c) is not correct.**
- **Hashing is a technique** that generates a fixed length value summarising a file or message contents. It is often incorrectly referred to as an encryption method. **Hence option (d) is not correct.**
  - Hash functions are used with cryptography to provide digital signatures and integrity controls but as no secret key is used it does not make the message private as the hash can be recreated.

**Q 92.A**

- **Recently, LeadIT Summit was hosted on the side-lines of COP27 of UNFCCC.**
- The Leadership Group for Industry Transition (LeadIT) gathers countries and companies that are committed to action to achieve the Paris Agreement. **Hence statement 1 is correct.**
- It was launched by the governments of **Sweden and India at the UN Climate Action Summit in September 2019** and is supported by the World Economic Forum. LeadIT members subscribe to the notion that energy-intensive industry can and must progress on low-carbon pathways, aiming to achieve net-zero carbon emissions by 2050. **Hence statement 2 is correct.**
- The Management Board is made up of representatives from Sweden, India, and the World Economic Forum. A Technical and Expert Committee, made up of LeadIT member representatives, advises the Board. The Management Board also decides on the workplan of the Secretariat.
- The Secretariat is responsible for managing the work of the Leadership Group and is hosted by **Stockholm Environment Institute (SEI). Hence statement 3 is not correct.**

**Q 93.D**

- **Recently the Meghalaya government in partnership with startup TechEagle has unveiled Asia's first drone delivery hub and network which is aimed at providing universal access to healthcare for the people in the state.**
- Drones offer tremendous benefits to almost all sectors of the economy like -agriculture, medicine delivery, mining, infrastructure, surveillance, emergency response, transportation, geo-spatial mapping, defence and law enforcement etc.
- As per Drone Rules, 2021, operation of drones in zones marked red and yellow on the drone airspace map zones requires permission from the Central Government and the Air Traffic Control (ATC) authority respectively. No permission is required to operate a drone in a green zone which is where most of the drone operations currently happen.
- The following are the applications of drones in various sectors:
- **Agriculture:**
  - Crop and soil health monitoring
  - Irrigation estimation and scheduling
  - **Requirement and efficacy assessment of fertilizer and pesticide spraying. Hence option 1 is correct.**
  - Anti-locust operations
  - Crop output estimates
  - River and canal erosion; restoration tracking
  - Insurance claim surveys

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- **Health:**
  - **Delivery of medicines, equipment and other supplies. Hence option 2 is correct.**
  - Pathology tests - sample collection from remote or epidemic/ pandemic affected areas
- **Defence:**
  - Surveillance
  - Combat
  - Communication in remote areas
  - Swarm drone solutions
  - Counter drone solutions
- **Power:**
  - Real-time surveillance of assets and transmission lines
  - Theft prevention and incident response
  - Visual inspection and maintenance
  - Construction planning and management
- **Environment:**
  - Monitoring of forests and wildlife
  - **Afforestation through seed-balls, irrigation and real-time monitoring. Hence option 3 is correct.**
  - Anti-poaching actions
  - **Pollution assessment and evidence-gathering. Hence option 4 is correct.**
- **Broadcasting:**
  - High quality videography of events and difficult-to-reach-places at a fraction of the cost and approvals required
  - Low altitude shooting without noise and-dust pollution and risk of accidents
  - Complete replacement of costly helicopter- based videography

**Q 94.B**

- Radon is a naturally occurring radioactive gas which may be found in high concentrations in indoor environments, such as homes and workplaces. Radon is **produced from the natural radioactive decay of uranium**, which is found in all rocks and soils. Radon can also be found in water. Hence, **statement 1 is not correct.**
- Radon escapes from the ground into the air, where it decays and produces further radioactive particles. As we breathe, these particles are deposited on the cells lining the airways, **where they can damage DNA and potentially cause lung cancer**. Radon is a major cause of lung cancer. It is estimated that radon causes between 3% to 14% of all lung cancers in a country, depending on the national average radon level and the smoking prevalence. **Hence, statement 2 is correct.**
- Radon is a major cause of lung cancer. For most people, the greatest exposure to radon occurs in the home and indoor workplaces. Radon enters buildings through cracks in the floors or at floor-wall junctions, gaps around pipes or cables, small pores in hollow-block walls, cavity walls, or sumps or drains. Radon levels are usually higher in basements, cellars and living spaces in contact with the ground.
- Well-tested, durable and cost-efficient methods exist for preventing radon in new buildings and reducing radon in existing dwellings. Some common ways of **reducing radon levels in existing buildings include**:
  - **increasing under-floor ventilation;**
  - installing a radon sump system in the basement or under a solid floor;
  - avoiding the passage of radon from the basement into living spaces;
  - **sealing floors and walls; and**
  - improving the ventilation of the building, especially in the context of energy conservation. **Hence, statement 3 is correct.**

**Q 95.C**

- Ministry of Environment, Forest and Climate Change, Government of India published the Battery Waste Management Rules, 2022 on 24th August, 2022 to ensure environmentally sound management of waste batteries.
- New rules will replace Batteries (Management and Handling) Rules, 2001.
- The rules cover all types of batteries, viz. Electric Vehicle batteries, portable batteries, automotive batteries and industrial batteries. **Hence statement 1 is not correct.**
- **The rules function based on the concept of Extended Producer Responsibility (EPR) w**here the producers (including importers) of batteries are responsible for collection and recycling/refurbishment of waste batteries and use of recovered materials from wastes into new batteries.

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- **EPR mandates that all waste batteries to be collected and sent for recycling/refurbishment, and its prohibits disposal in landfills and incineration.** To meet the EPR obligations, producers may engage themselves or authorise any other entity for collection, recycling or refurbishment of waste batteries. **Hence statement 3 is correct.**

- **The rules will enable setting up a mechanism and centralized online portal for exchange of EPR certificates** between producers and recyclers/refurbishers to fulfil the obligations of producers. **Hence statement 2 is correct.**
  - The rules promote setting up of new industries and entrepreneurship in collection and recycling/ refurbishment of waste batteries.
- Prescribing the use of certain amount of recycled materials in making of new batteries will reduce the dependency on new raw materials and save natural resources.
- Online registration & reporting, auditing, and committee for monitoring the implementation of rules and to take measures required for removal of difficulties are salient features of rules for ensuring effective implementation and compliance.
- On the principle of Polluter Pays Principle, environmental compensation will be imposed for non-fulfilment of Extended Producer Responsibility targets, responsibilities and obligations set out in the rules. The funds collected under environmental compensation shall be utilised in collection and refurbishing or recycling of uncollected and non-recycled waste batteries.

**Q 96.A**

- To commemorate Sukapha and his rule, Assam celebrates "Asom Divas" on December 2 every year.
- **Chaolung Sukapha was a 13th-century ruler who founded the Ahom kingdom that ruled Assam for six centuries.** Contemporary scholars trace his roots to Burma. Sukapha was a leader of the Ahoms. He reached Brahmaputra valley in Assam from upper Burma in the 13th century with around 9,000 followers
- **Chaolung Sukapha's** significance — especially in today's Assam — lies in his successful efforts towards assimilation of different communities and tribes. He is widely referred to as the architect of "Bor Asom" or "greater Assam".
- Sukapha is said to have left a place called Maulung in AD 1215 with eight nobles and 9,000 men, women and children — mostly men. He had with him two elephants, and 300 horses. Gait wrote that In 1235, Sukapha and his people settled in Charaideo in upper Assam after wandering about for years, defeating those who protested his advance, and temporarily staying at different locations.
- It was in Charaideo that Sukapha established his first small principality, sowing the seeds of further expansion of the Ahom kingdom.
- The founders of the Ahom kingdom had their own language and followed their own religion. Over the centuries, the Ahoms accepted the Hindu religion and the Assamese language.
- **Hence option (a) is the correct answer.**

**Q 97.B**

- The Government of India set up the **Bureau of Energy Efficiency (BEE) under the provisions of the Energy Conservation Act, 2001.** The mission of the Bureau of Energy Efficiency is to assist in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act, 2001 with the primary objective of reducing the energy intensity of the Indian economy. **Hence statement 1 is correct.**
- **BEE of India is an agency under the Indian Ministry of Power.** The organization coordinates energy efficiency and conservation policies and programs and establishes systems and procedures to measure, monitor and verify energy efficiency results in individual sectors as well as at a macro level. BEE focuses on eleven industrial sectors, which are Aluminum, Cement, Chemicals, Coalmine, fertilizers, Furnaces, HVAC, Automobile, Petrochemical, Steel and Textile. **Hence statement 3 is not correct.**
- The Energy Conservation Act provides for regulatory and promotional functions. The Major Promotional Functions of BEE include:
  - Create awareness and disseminate information on energy efficiency and conservation
  - Arrange and organize training of personnel and specialists in the techniques for efficient use of energy and its conservation
  - Strengthen consultancy services in the field of energy conservation
  - Promote research and development
  - Develop testing and certification procedures and promote testing facilities
  - Formulate and facilitate implementation of pilot projects and demonstration projects
  - Promote the use of energy-efficient processes, equipment, devices and systems
  - Take steps to encourage preferential treatment for use of energy-efficient equipment or appliances

- Promote innovative financing of energy efficiency projects
- **Give financial assistance to institutions for promoting the efficient use of energy and its conservation**
- Prepare educational curriculum on efficient use of energy and its conservation
- Implement international cooperation programmes relating to the efficient use of energy and its conservation
- **Hence statement 2 is correct.**

- **Various schemes of Bureau of Energy Efficiency (BEE)**
  - National Mission for Enhanced Energy Efficiency (NMEEE)
  - Energy Conservation Building Code (ECBC)
  - Standards and Labeling Scheme
  - Municipal Demand Side Management (MuDSM) Scheme
  - Agricultural Demand Side Management (AgDSM) Scheme

**Q 98.A**

- **Methaemoglobinaemia also called 'blue baby syndrome', is a severe kind of anaemia among infants caused when drinking underground water contaminated with nitrates**. The excessive use of nitrates in agriculture has contaminated groundwater resources.
- The nitrates being soluble in water trickle down through layers of soil into deeper layers of earth and ultimately are added to the underground stores of water. In many villages and townships where groundwater is the only source, of drinking water this causes, methaemoglobinaemia, particularly in bottle-fed infants, because they are very sensitive to this pollutant.
- **When water containing nitrates is consumed, it goes to the intestines**, where **intestinal bacteria convert nitrates into nitrites**. Nitrite ion combines with haemoglobin to form methaemoglobin, which inhibits the oxygen-carrying capacity of the blood, causing a kind of anaemia known as Methaemoglobinaemia.
- **Hence, option (a) is the correct answer.**

**Q 99.B**

- National Clean Air Programme (NCAP) was launched by the MoEFCC in January 2019. It is the first-ever effort in the country to frame a national framework for air quality management with a time-bound reduction target.
- It originally sought to cut the concentration of coarse (particulate matter of diameter 10 micrometers or less, or PM10) and fine particles (**particulate matter of diameter 2.5 micrometers or less, or PM2.5)** by at least 20% in the next five years, **with 2017 as the base year for comparison. Hence, statement 2 is correct.**
- However, **the Centre has recently set a new target of a 40 percent reduction** in particulate matter concentration in cities covered under the **National Clean Air Programme (NCAP) by 2026**, updating the earlier goal of a 20 to 30 **percent reduction by 2024. Hence, statement 1 is correct.**
- **The NCAP is implemented in selected 132 cities (not in all tier II and tier III)in the country**. NCAP covers Non-Attainment Cities (NACSs) wherein the National Ambient Air Quality Standard (NAAQS) is exceeded for 5 consecutive years. Under NCAP, 124 cities identified as NACs and 8 other million-plus cities of the Fifteenth Finance Commission- Million Plus Cities Challenge Fund are covered. There are eight metropolitan tier I cities in India – Delhi, Mumbai, Bangalore, Chennai, Hyderabad, Kolkata, Ahmedabad and Pune. On the other hand, 104 cities are categorized as tier II cities in India, while the remaining cities fall under the tier III cities in India category. **Hence, statement 3 is not correct.**

**Q 100.A**

- **The Dublin Statement on Water and Sustainable Development**, also known as the Dublin Principles, was a meeting of experts on water related problems that took place on 31 January 1992 at the **International Conference on Water and the Environment (ICWE), Dublin, Ireland.**
- **The Dublin Statement on Water and Sustainable Development recognises the increasing scarcity of water as a result of the different conflicting uses and overuses of water.**
- **The 1992 Dublin Conference established four guiding principles for managing freshwater resources:**
  - Water is a finite and vulnerable resource, essential to sustain life, development and the environment;
  - Water development and management should be based on a participatory approach, involving users, planners and policymakers, at all levels;
  - Women play a central part in the provision, management and safeguarding of water;
  - **Water has an economic value in all its competing uses and should be recognised as an economic good. Hence option (a) is the correct answer.**

- The output from this conference was a declaration regarding water that was presented to the United Nations Conference on Environment and Development (UNCED) that was held in Rio de Janeiro in 1992. The Rio conference came to be known as the "Earth Summit".
- **The inclusion of the Dublin Principles in the conference debate helped to highlight the importance of water as a resource for environmental protection and human development.** The Dublin Principles remain the standard for consideration of the issues surrounding water resource use and protection.

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